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Electrical World

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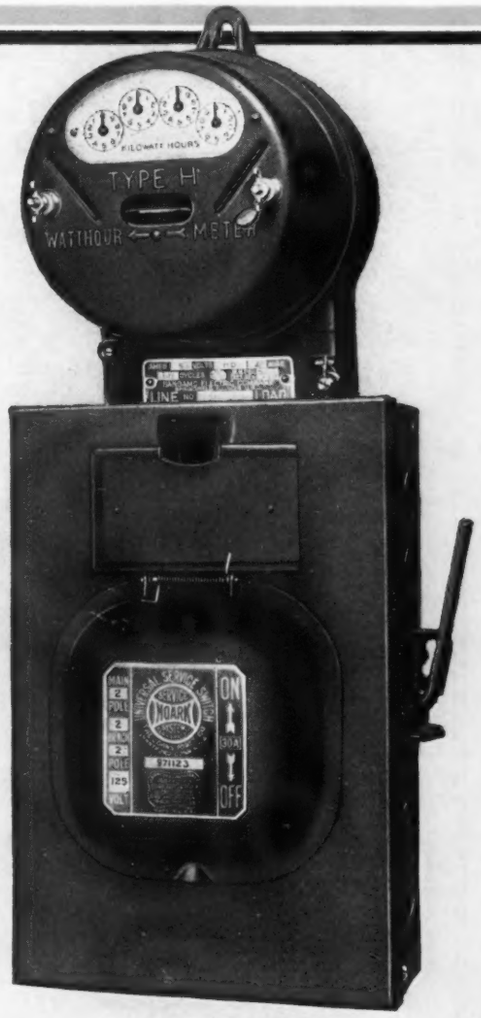

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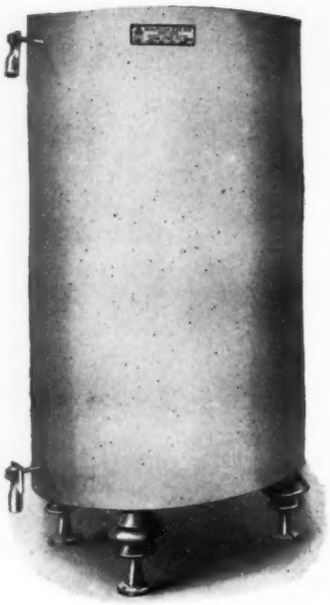

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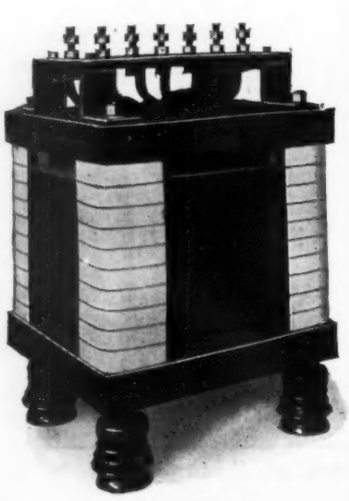

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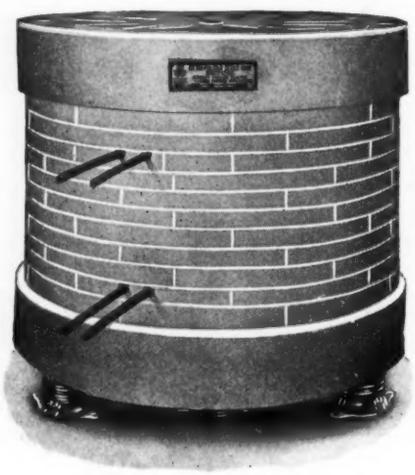

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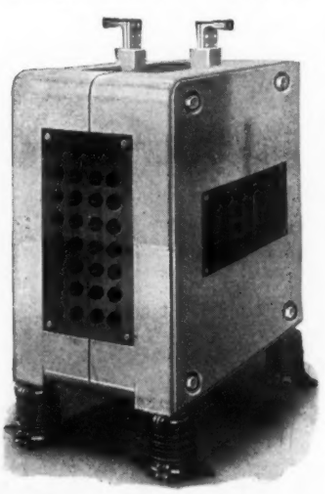

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Electrical World

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W. H. ONKEN, JR. Editor

HAROLD V. BOZELL Editor

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The Challenge in Superpower and Interconnection

THERE is no escaping the conclusion that superpower and interconnection have gripped the popular mind. Addresses delivered before the convention of the National Electric Light Association last week by prominent men outside the industry prove that. The public, from all indications, is also satisfied to have the industry work the matter out, on the theory perhaps that the details are too technical and the skill required too special and exacting to permit those less conversant with the economic problems involved to dabble with the matter. This attitude, however, brings a challenge to the electric light and power industry.

Certainly Secretary Hoover and Governor Pinchot have no mean conception of superpower. They vision something more than mere interchange of surplus energy. To them superpower and interconnection mean huge reservoirs of power, mammoth steam and hydroelectric stations, heavy trunk-line transmission systems. As public officials the analogy between state highways, trunk-line railroads and superpower systems appeals strongly to them. Therein lies the challenge. Both Secretary Hoover and Governor Pinchot are favorable to private ownership and initiative. One might even go so far as to say that both are kindly disposed to the electrical industry as at present constituted, and both are expecting great things of it. The question is, can the industry afford to be less enthusiastic about superpower and interconnection than men not identified with it, or can its conceptions of superpower and interconnection and their ultimate possibilities be one whit less exalted? Most assuredly not, and the industry must not, and will not, for want of vision intrust the banner of superpower and interconnection to hands other than its own.

Fortieth Anniversary of the Westinghouse Company

THE fortieth anniversary of the active entrance of George Westinghouse into the field of electrical development was celebrated last week by the company bearing his name. In his day and generation George Westinghouse was a power in the industry not only of this country but also of the world. His contributions to the art were invaluable, and his advocacy and development of alternating currents, springing from prophetic vision, were phenomenal in their effect. To the commercial and organizing genius of Westinghouse, more than to the efforts of any other man, is due the status of alternating current in this country. Stanley, Tesla, Shallenberger and others, it is true, did much of the work; but it was Westinghouse who encouraged and inspired them, and who finally wrought a dramatic triumph for their achievements. The ELECTRICAL WORLD therefore offers its congratulations to the splendid organization he left behind—an organization still imbued with the Westinghouse spirit. The heritage of a great name and of an unshakable purpose is theirs. So also is the inspiration of great accomplishments. George Westinghouse still lives. In the annals of the electrical industry, which, could the progress of humanity be seen in its true perspective, might loom larger than the annals of war and politics, his is

> One of the few, the immortal names
> Which were not born to die.

The Trenton Channel Station

A NEW station designed by the staff of the Detroit Edison Company is always studied with interest because the past accomplishments of this group of engineers have established their reputations as daring yet conservative designers of stations to give economical performance. The Trenton Channel station was designed as a transmission station only, and its entire energy—ultimately to reach 300,000 kw.—is transmitted at 120,000 volts to the Detroit network. For this reason many features of the design are peculiar to the installation and differ from those found in other Detroit stations. For example, the necessity for varying the main bus voltage through a wide range made it advisable to adopt an entirely separate provision for auxiliary power supply.

The basic design features of the station, with steam at 375 lb. and 700 deg. F., are conservatively near the upper values found in practice, and it is noticeable that the regenerative steam cycle with three extraction points was adopted. The use of three boilers per 50,000-kw. steam unit compares very favorably with the use of eight or nine boilers per unit in other stations of the same magnitude, and the expected performance of about 9.4 lb. of steam per kilowatt-hour is very good. Of course, the pulverized-fuel installation excites interest as this is the third large station of very recent construction to use this type of firing. The installation is unique in that Cottrell precipitators for the ash are installed and extracted steam from the house units is used in the driers when desired.

The feed-water system has been carefully designed to eliminate air absorption in condensate, and the single-pass staggered-tube condensers with special-design features afford an example of improvement in a type of equipment that has been rather static in development. With respect to auxiliary power supply three sources are available, direct current for essential drives, alternating current for other drives and a reserve alternating-current supply from an adjacent substation. Thus the past practice of the Detroit engineers in using direct current from house turbines is continued. The

design as a whole is well rounded and capable of serving the needs of the company, and, as is natural, any disagreement as to minor features must await operating records for answer. The electrical features of the station will be described in a later article than the one appearing this week.

What Makes Utility Advertising Effective?

PUBLIC utility advertising is improving in quality. This is all the more gratifying in view of its increased volume as the public relations movement gains stanch adherents throughout the country. Within the past few months a marked increase in originality has characterized central-station advertising in particular, and as a result the space bought in local newspapers is more attractive and is telling the story of the industry in a better way than of old. The keynote of this improvement is the concentration of reader interest upon a single major idea expressed in a direct, simply worded message.

Thus the merchandising department pictures a particular electrical service like house cleaning or cooking; the power engineer stresses the economy and advantages of a particular motor drive or industrial electrical heating installation, and the securities department focuses attention upon the stability, yield and convenience of purchase of his offerings. The manager tells his public about the company's own citizenship in the community, sketching its broader paths of future development. These pictures of better service and of improved ways of doing things electrically attract many readers, and the opportunities before public utilities to do creative advertising along this line deserve the favorable consideration of progressive central-station managers.

Testing Ears as Eyes Are Tested

FROM time to time we record in these columns new applications of electricity whose benefit to humanity is not measured in kilowatts, nor even in many watts, but in those intangible units of service which give new courage to live and to work. A recent device of this character is the audiometer developed by some well-known telephone research workers as a by-product of their fundamental studies of speech and audition. As the name indicates, the audiometer serves to measure quantitatively the acuity and quality of hearing of either ear. The source of sound is a vacuum-tube circuit which can be set to give a pure tone of a desired pitch within the audible range. The intensity of sound can be controlled on a scientific basis, that is, in root-mean-square air pressure of sound waves (say in millidynes per square centimeter). The person under examination simply listens in a telephone receiver while the intensity of sound of a certain pitch is being varied by the operator. When the sound is no more audible, the dial is read and this represents the "threshold of audibility" for that particular person. The values read are plotted against pitch as abscissas and thus give a true quantitative record of that person's hearing. This is not unlike a record of one's eyesight obtained by an oculist.

For impaired hearing some corrective devices are already on the market, and better ones will undoubtedly be available before long as a result of knowing in which range of pitch an amplification is particularly needed in a given case. Further studies of speech articulation and of the range of frequencies in various vowels and consonants will also help to improve such sound-amplifying devices. Aside from being a step toward bringing further relief to those hard of hearing, the audiometer will also have some other useful applications—for example, in delicate diagnosis of ear troubles, in determining the fitness of an applicant for an insurance policy, an automobile license, army or railway service, etc. Above all, its use should be recommended for hearing tests in schools, in order that a child with impaired hearing may receive proper care or at least directed toward occupations in which this shortcoming will not be a less handicap than in others.

Theories of the Atom

FOR some time it has been evident that physical research is entering on a new phase. All of the more obvious natural laws seem to have been thoroughly explored and their limits, in relation to known materials and ranges of value subject to man's observation, fairly well determined. But it is in the question of underlying theory that the physicist has always found his great problem. Isolated theories to account for single classes of phenomena have been proposed and many of them appear well sustained. When, however, it comes to the interrelation of these theories, discrepancies and contradictions are found, and the physicist is now confronting an entirely new set of problems which center around the nature of the structure of the atom and the character of the processes involved in the transference of energy by radiation.

The visit to America at this time of Prof. Neils Bohr of the University of Copenhagen has given additional point to the general interest in the question of the structure of the atom aroused only a few months since by the similar visit of Sir Joseph Thomson of Cambridge. Both of these distinguished scientists have contributed largely to our present knowledge of the atom. Each of them has a theory as to its structure. Their theories are alike in that each postulates a central positive nucleus surrounded by successive electron orbits, the number of orbits and the number of electrons in each determining the chemical properties of the atom. The two theories differ, however, in that one clings to the classical theory that electromagnetic force is a continuous process while the other, that of Professor Bohr, provides that radiation takes place in pulses, thus bringing the inherent electrical nature of the structure into accord with the "quantum" theory of Planck as based on the phenomena of thermal radiation.

Another great contributor in this field is Sir Ernest Rutherford, to whom is due most of our still meager knowledge of the nature of the positive nucleus. The startling results of these men and others, presenting as they do a conception of the atom as a universe in itself, with distances inconceivably small but differing among themselves relatively by enormous values, have not only made a powerful appeal to general interest but have set up an entirely different atmosphere in the field of physical research. Practically all efforts

in this field now are directed in one way or another to the obtaining of further evidence as to the nature of the structure of matter.

Two particularly striking types of experiments have recently been described. One of these is an extension of the method of Wilson of photographing the path of the alpha particle of radium, itself a positive charge. In passing through a rarefied gas these rapidly moving particles ionize the molecules of the gas, and the electrons thus detached form, in the presence of water vapor, small drops which may be photographed by reflected light. The whole series of such droplets reveals itself as a straight line on the photographic plate. So small, however, is the positive nucleus of an atom that the alpha particle very rarely hits the nucleus squarely but only plunges through the outer rings of electrons, like a comet, sometimes knocking one of them out. By taking a large number of photographs it has recently been possible to observe the actual collision between the alpha particle and the positive nucleus, and the results of the photographs give much confirmatory evidence of the indications from other directions as to its mass and nature. Another interesting line of experiment is that of the radiation from gases which are in process of ionization. The electron systems of certain elements, based on the Thomson theory, call for a single electron in the outer orbit. If this electron could be removed, it would leave an inner system closely resembling that of some other element. Under ionization this outer electron is being continuously knocked off, returning thereafter promptly to the system. If the ionization is continuous, however, there are always present a number of atoms from which the ion is momentarily detached. Certain gases under these circumstances give strong evidence that their spectra in the ionized state are similar to the spectra of quite different substances which have in each case the closely related atomic structure indicated. The suggestion from experiments of this kind is that if we could permanently detach these electrons from the outer orbits we should have transmutation from one kind of matter to another.

Citizens First—Then Engineers

ENGINEERS are frequently accused of assuming a "holier than thou" attitude in their associations with their fellow citizens. It is true that too often they "pooh-pooh" political activities in their communities and give the impression of saying, "How ignorant some people are!" By nature engineers are preoccupied and introspective—which counts against them in the popular mind.

Now, this tendency certainly does not follow the gospel preached by many of the engineering profession who maintain that government is a business that needs more orderly thinking, and that the only way to get orderly business methods into government is to have engineers with business judgment enter public life. For how many engineers read or talk intelligently on local government problems with a business background? How many know or care about city zoning plan, street lighting, local transportation, water supply, fire protection and the many other governmental activities of their municipalities in which their training makes them competent to participate and to advise?

Only a very small percentage have ever taken any active share in such civic responsibilities, and it is even difficult to get the average engineer to react to the troubles of brother engineers in lines of activity distinct from his own. If the railway company is in trouble, or the telephone company, or the gas company, or the light and power company, the support of the engineers in the community might be invaluable; but today they cannot be depended upon to function as an intelligent, understanding, active element in public opinion. The engineer's participation in public affairs should start in his own home town, and only as he thus learns to develop his immediate opportunities for service in bringing about better civic conditions can he expect to obtain a hearing in national affairs.

Daylight on Dielectric Breakdown

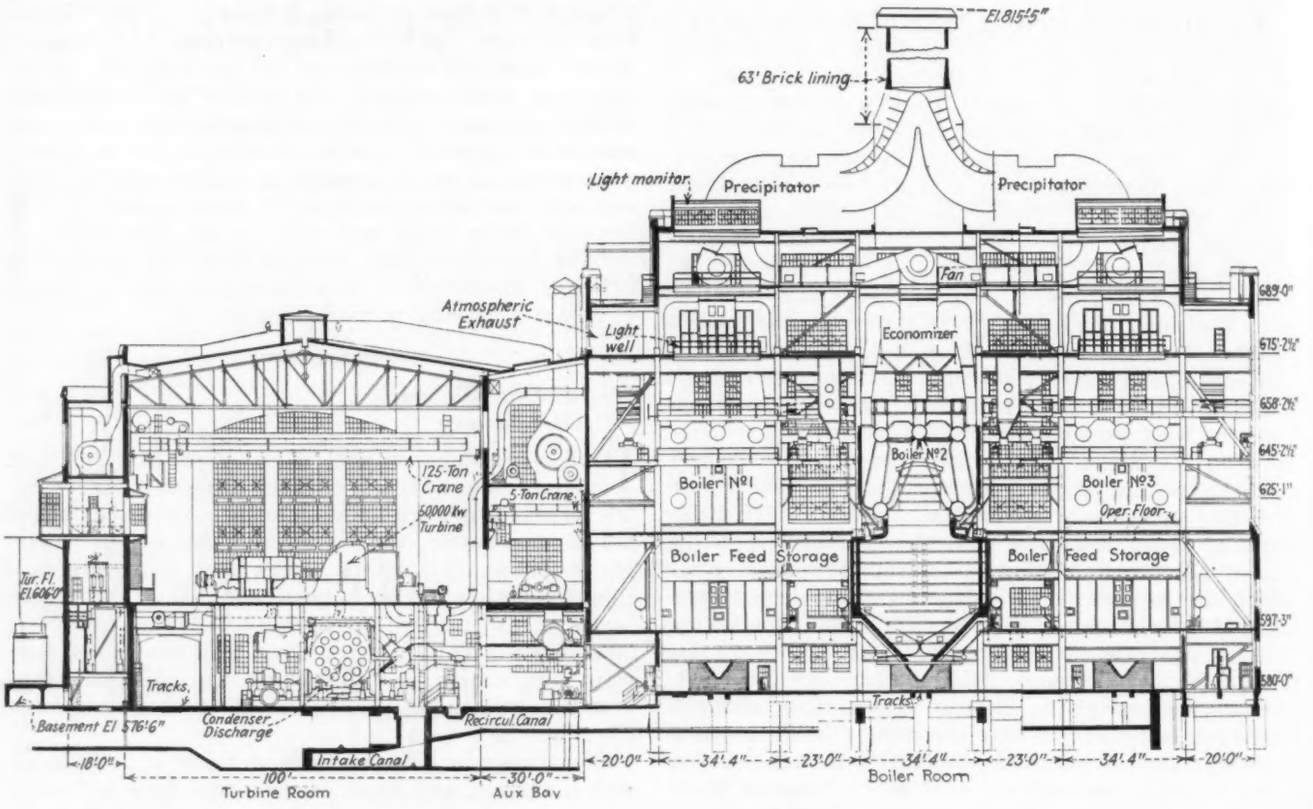
IT IS encouraging to note the progress that has been made in determining the exact phenomena of dielectric breakdown, for this knowledge is fundamental for the further development of all high-voltage equipment. Insulation and insulators, cables and many practical things dependent on them require that their designs be based on exact quantitative information on dielectric breakdown. While progress has been made, yet complete information is still lacking and this handicaps practical economies in generation, transmission and distribution.

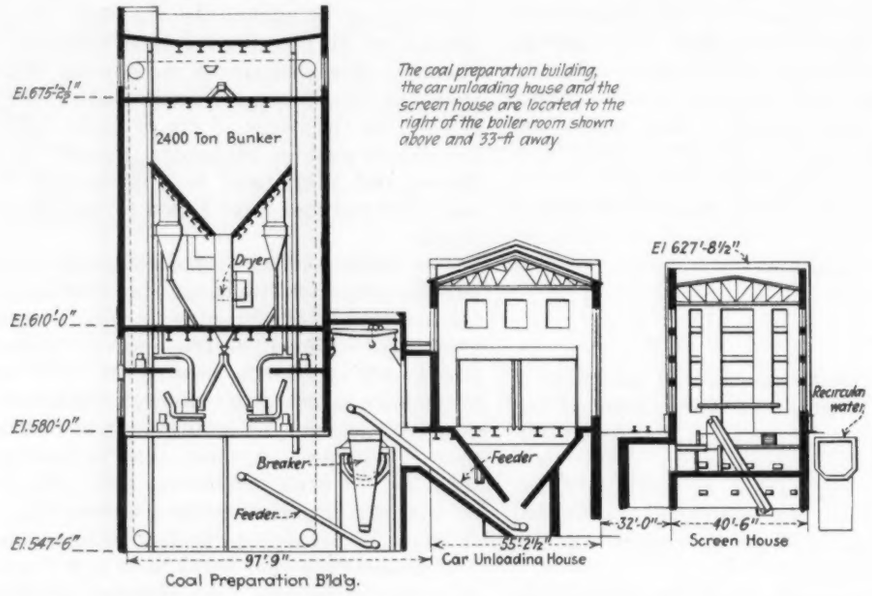
The dielectric field has proved to be a difficult research subject, and many experimental data and many theories have been recorded which are difficult to reconcile or to apply. In the field of solid dielectric breakdown it remains an open question whether electrostatic stress produces mechanical deformation, and even the breakdown of cable dielectrics has been explained on the bases of six or eight different theories. Specialists such as Steinmetz, Russell, Osborn, Fernies, Simon and Whitehead have presented theories which have differed and have failed to satisfy all of the conditions.

But agreement has come about gradually on certain fundamental conditions, and a starting point was the notable work of Shrader in determining the three groups of solid dielectrics on a conductivity basis. Nearly all specialists now agree that solid dielectric breakdown comes about through the action of heat produced by losses. In addition, it is pretty well agreed that the losses are those due to electrostatic action such as dielectric hysteresis and others which occur because of imperfections in the dielectrics, occluded air or gases, moisture or chemical compounds.

Thus knowing that breakdown is a temperature effect requiring a definite time element has been one great step forward. Other steps are being made through individual researches on the dielectric behavior of air, oil, gases and solid materials both separately and in combination for various conditions of temperature, pressure and moisture. The application of the electron theory, studies in ionization and investigations of corona phenomena have aided greatly in gathering positive data on the behavior of dielectrics under stress conditions. Once these researches are complete an understanding of the phenomena and of the behavior of dielectrics should be available, and the time does not seem distant when this goal will be reached.

Trenton Channel Station





The coal preparation building, the car unloading house and the screen house are located to the right of the boiler room shown above and 33-ft away

THE Detroit Edison Company is about to place in operation a station which will ultimately contain six 50,000-kw. units. Outstanding features of the station are:

1. It will use pulverized fuel.

2. It will be a transmission station only and will supply a 120,000-volt ring system.

3. Because of bus voltage regulation there will be no connection between the main bus and auxiliary power supply.

4. A Cottrell electrical precipitator for handling ash is installed.

5. The station operates on a regenerative cycle with steam bled at three points. Steam pressure is 375 lb. at 700 deg. F.

6. The station expects to produce 1 kw.-hr. on 9.4 lb. of steam.

7. Single-pass condensers with staggered tubes, ash sluicing, unusual pump priming and feed-water system are other interesting features.

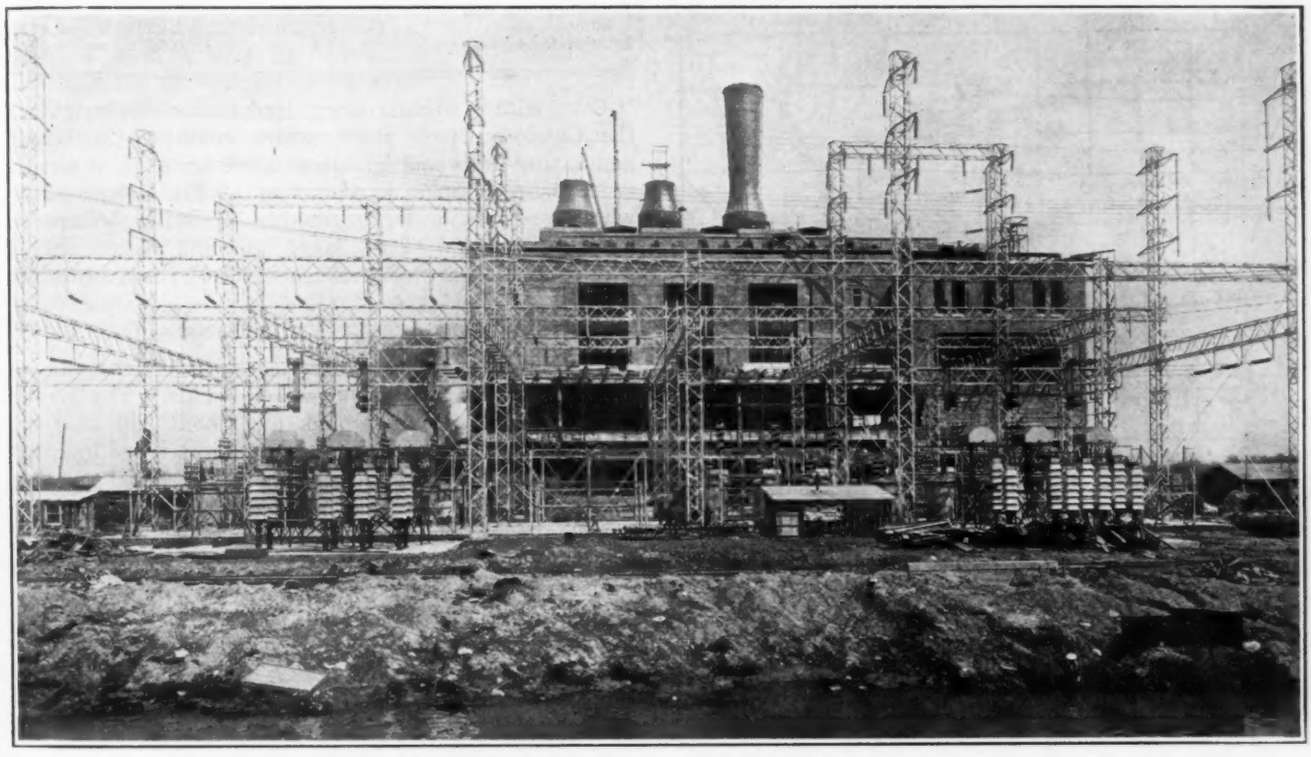
8. Direct current is supplied to all essential auxiliaries from house turbines. Another auxiliary supply for non-essential auxiliaries is available from other house turbines, and this supply has a reserve service from a local substation.

The Detroit Edison Company has an established reputation for good station design, and the new station will afford many interesting features of development and operation.

Design Features of Trenton Channel—I

New Station of Detroit Edison Company Designed for Reliable and Economical Operation—Past Experiences Utilized in Selection of Equipment—General Design Features and Reasons for Decisions

By PAUL W. THOMPSON
Chief Assistant Engineer of Power Plants, Detroit Edison Company



THE 120-KV. OUTDOOR STATION, WITH THE TRENTON CHANNEL PLANT IN THE BACKGROUND

RELIABILITY, simplicity of operation, operating and maintenance economy and economy of first cost were the problems to be met in the design of the new Trenton Channel station of the Detroit Edison Company. First consideration to the feature of reliability was in every instance given. Advantage might have been taken of certain other methods which would have resulted in better thermal economy, but experience in their adaptation was lacking and there was no desire to undertake in any way experiments in these methods. Experience gained at the other plants of this company formed the basis of most of the decisions as to type and arrangement of apparatus. The use of pulverized fuel represents the greatest departure from the company's standard practice, but its successful use in other central stations proves its practicability, and in no sense is it considered an experiment.

It became apparent several years ago that it would eventually become necessary to provide additional generating capacity somewhere in the southern portion of the territory served by the Detroit Edison Company for the purpose of taking care of the natural increase in the demand for power and to relieve the Delray plant, which is the oldest generating plant in the system, for possible rebuilding. To this end property situated just south of the village of Trenton, Michigan, was secured as a plant site. It is on an island in the west branch of the Detroit River separated from the mainland by a swamp, since reduced to a dredge cut. The plant is named for the west branch of the Detroit River, known as

THIS article deals particularly with the engineering features involved in the design of the power station, and the author has presented, in addition to a general description, the considerations involved in determining the major features of the plant, the influence of past experience and the resulting conclusions. The plant is not yet in operation, but it is expected to have one generating unit in operation during the early summer of this year and another in the fall, followed by a third in January, 1925, giving then a total generating capacity of 150,000 kw. A second article will deal with the electrical features of the station.

the Trenton Channel. The Detroit River being the only body of water within reasonable distance which could adequately serve a large plant with condensing water, a location somewhere along its shore was the obvious choice.

This particular location, however, fulfilled other prerequisites. The railroad facilities are particularly good, the site being near four railroads and outside the congested freight yards of Detroit. Solid rock is found a few feet below the surface, making it unnecessary to provide elaborate foundations as at Connors Creek and necessitating rock excavation in but very few places. This is the ledge of rock that shoals the Detroit River at what is known as the Lime Kiln Crossing, which is

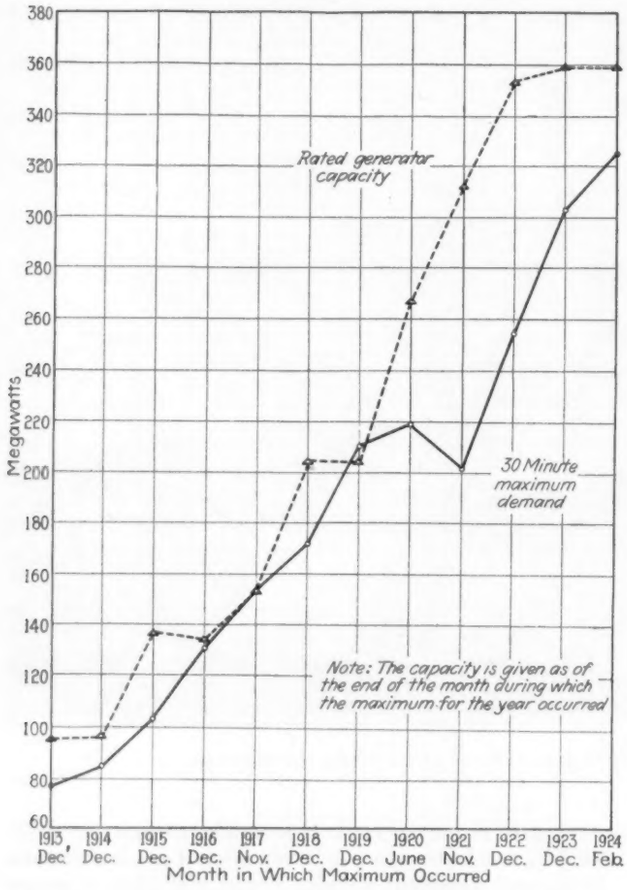


FIG. 2—CURVE OF YEARLY SYSTEM DEMAND AND AVAILABLE GENERATING CAPACITY, SHOWING THE MONTH IN WHICH THE MAXIMUM DEMAND OCCURRED

one of the three shoals limiting the draft of vessels operating in the Great Lakes.

The plant as designed will accommodate ultimately six 50,000-kw. turbo-generators with the necessary boiler capacity, although there is nothing which limits the ultimate capacity to this exact figure or the size of the generating units to 50,000 kw. should it later become desirable to increase either. The section of the plant now under construction is for three of these generating units, to be supplied with steam at approximately 375 lb. gage pressure and 700 deg. F. from eight 2,909-hp. type W Stirling boilers, fired with pulverized coal. Both boiler and turbo-generator units are of large capacity and were chosen as a result of the satisfactory experience now being obtained with units of practically the same size at the Connors Creek plant. With a system demand large enough to warrant units of this size, their adoption affords a marked advantage in space requirements and in lower operating labor costs.

This latter fact is borne out by a comparative study of the operating labor costs at the Delray and Connors Creek plants. Average operating labor required for the year 1923 for the two stations mentioned above is shown in the following tabulation:

	Kw.-Hr. Delivered by Station per Man-Hour	
	Delray	Connors Creek
Turbine room operating labor	3,929	7,642
Boiler room operating labor	1,921	3,659
Turbine room and boiler room operating labor	1,290	2,474
Annual load factor	0.527	0.499

Even with a slightly lower load factor, the output of the Connors Creek plant, which contains the larger generating units and boilers of 2,365 hp. each, is almost twice as much per man-hour as at the Delray plant, which operates a large number of small boilers in addition to a few of the large type and all but one of whose turbines are vertical machines of relatively small capacity.

Circulating-Water Canals

The Trenton Channel site lends itself to a simple arrangement of circulating-water canals. The screen house is near the river bank and about 200 ft. from the plant proper, the water passing from there by canal under the boiler room to a distributing canal running lengthwise of the turbine room. The overflow canal is immediately over the intake for practically its entire length. It discharges through two flumes running transversely under the switch house and outdoor transformer mat to the dredge cut west of the plant. The double-checked arrangement affords an easy way to recirculate warm overflow water back to a distributing flume at the screen house, from which it may be discharged in front of the revolving screens at times when they would otherwise become blocked with ice and the water supply to the condensers be jeopardized.

Reasons for Using Pulverized Fuel

The decision to use pulverized fuel, it is perhaps needless to say, was arrived at after a thorough study of the merits and possibilities as well as disadvantages of this method of burning. About 1911 a situation requiring a decision of a similar nature was met, when it was decided to install the Taylor stoker under the Delray boilers. That decision was based not so much upon the efficiency obtained during test as upon the possibilities for future development and improvement with this particular type of stoker. Later, when the Connors Creek plant was built, experience already gained at Delray dictated certain features in connection with the application of this method of firing. These were incorporated in the Connors Creek design, and the boiler test which was made there in 1921 proved that a number of collateral advantages had been accomplished. The maximum steaming rating, however, had not been materially increased. The results of the 1921 test indicated that a change in boiler baffling would produce better economy. Accordingly, when the Marysville plant was constructed the boilers were baffled differently from those at Connors Creek, with the result that they are more economical. A still later type

of Taylor stoker was installed, and by taking advantage of other factors it is possible to carry the boilers at a considerably higher steaming rate than at either Delray or Connors Creek.

Just as in making the earlier choice between overfeed and underfeed stokers, consideration was given to the possibility of the further development of the newer type. So in deciding for the pulverized-coal process its probable ultimate development was weighed with the undoubted possibilities of further improvement of stokers. The experience at Milwaukee had already demonstrated the reliability of the process for central-station use and its great promise of adaptability and efficiency.

In estimating the performance of the two systems of burning under consideration for Trenton Channel efficiency with stokers and their cost of operation and maintenance were based upon the long experience in the Detroit plants and upon the mass of data obtained in 1921 from the painstaking and extensive test of a boiler and stoker at Connors Creek. For the other system complete access was had to operating costs experienced at the Lakeside plant of the Milwaukee Electric Railway & Light Company, together with the data from boiler tests at the plant carried on under the supervision of Henry Kreisinger in 1921.

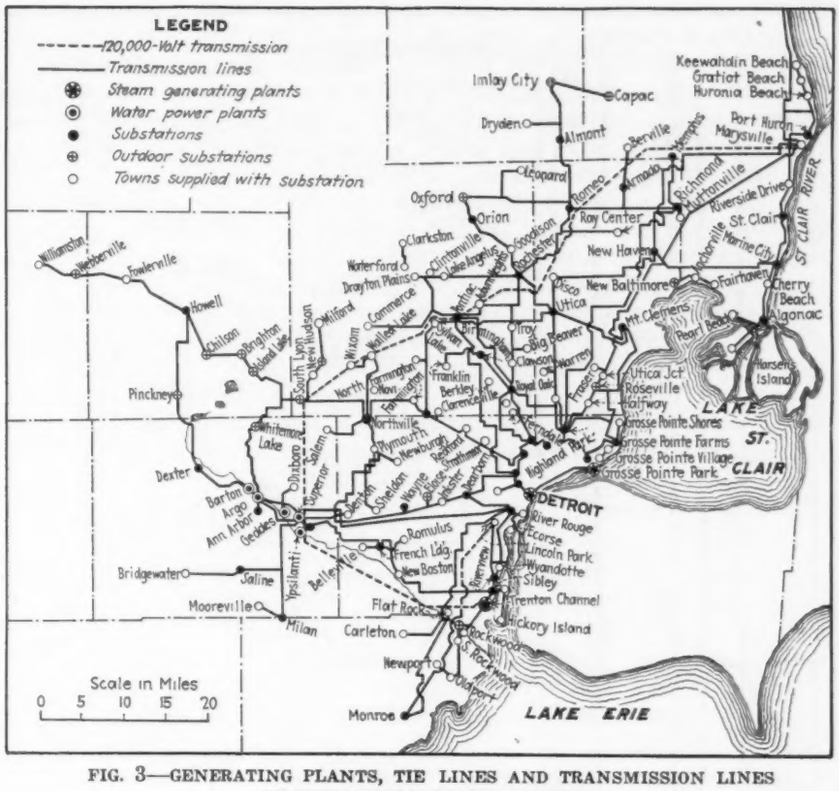


FIG. 3—GENERATING PLANTS, TIE LINES AND TRANSMISSION LINES OF THE DETROIT EDISON SYSTEM

Conditions at Trenton differ somewhat even from those at Connors Creek. The steam pressure is 380 at superheater outlet instead of 220; the plant will be equipped with economizers; the amount of boiler surface differs slightly—all conditions which affect fuel economy. Nevertheless, an analysis of furnace and stack losses determined by the tests referred to in the preceding paragraph as representing the two methods of firing afforded data upon which performance in the new plant can be predicted. Due allowance was made for new departures, the greater furnace volume and the higher rates of steaming referred to boiler heating surface. Construction estimates were likewise made in detail for the purpose of comparing investment charges.

The final conclusions based upon the comparison were that the total operating expense per ton of coal from the unloading hopper to ash disposal, including all operating and maintenance labor and material, miscellaneous supplies and expenses and electrical energy consumed, would in the case of pulverized fuel be approximately 16 cents greater than with stokers. Considering the relative efficiencies to be expected, a comparison of the heat balances of the Connors Creek boiler test was made with the heat balances obtained on a test of a pulverized-fuel-fired boiler. This showed that the loss due to carbon in the refuse was the largest item of saving in favor of pulverized fuel, amounting to approximately 3 per cent, while the loss in the flue gas amounted to about 1 per cent more in the case of stoker firing as compared with pulverized fuel.

Bearing in mind that test conditions are always somewhat artificial, it is well to consider every-day operation and its bearing on results. From this standpoint there are two advantages attained by the pulverized burning method.

Efficient stoker operation is very much dependent upon the skill of the operator in properly judging the correct thickness of the fuel bed and his ability to perceive immediately any improper fire conditions such as holes in the fuel bed and the formation of clinkers on the tuyères. Granting that the stoker operators are skilled, nevertheless unavoidable losses do occur in regular operation which do not occur to such a great extent during a test. With pulverized fuel, on the other hand, where the operator's judgment as to combustion conditions is not so essential, there is reason to believe that closer conformity to test conditions can be maintained.

The other advantage referred to lies in the prospect

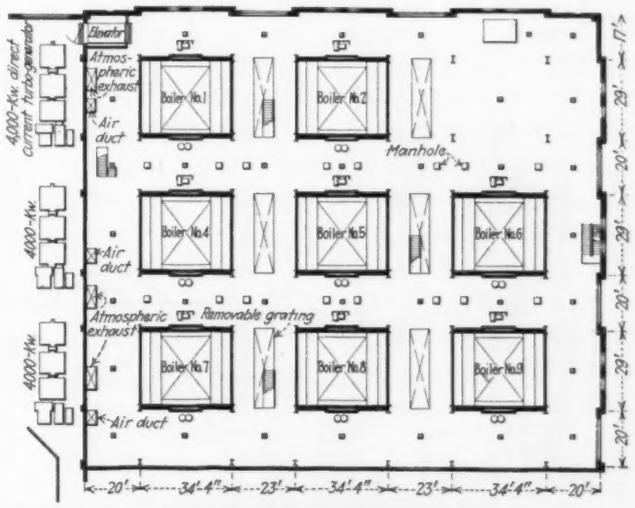


FIG. 4—OPERATING-FLOOR PLAN OF BOILER HOUSE. THREE BOILERS ARE USED PER UNIT

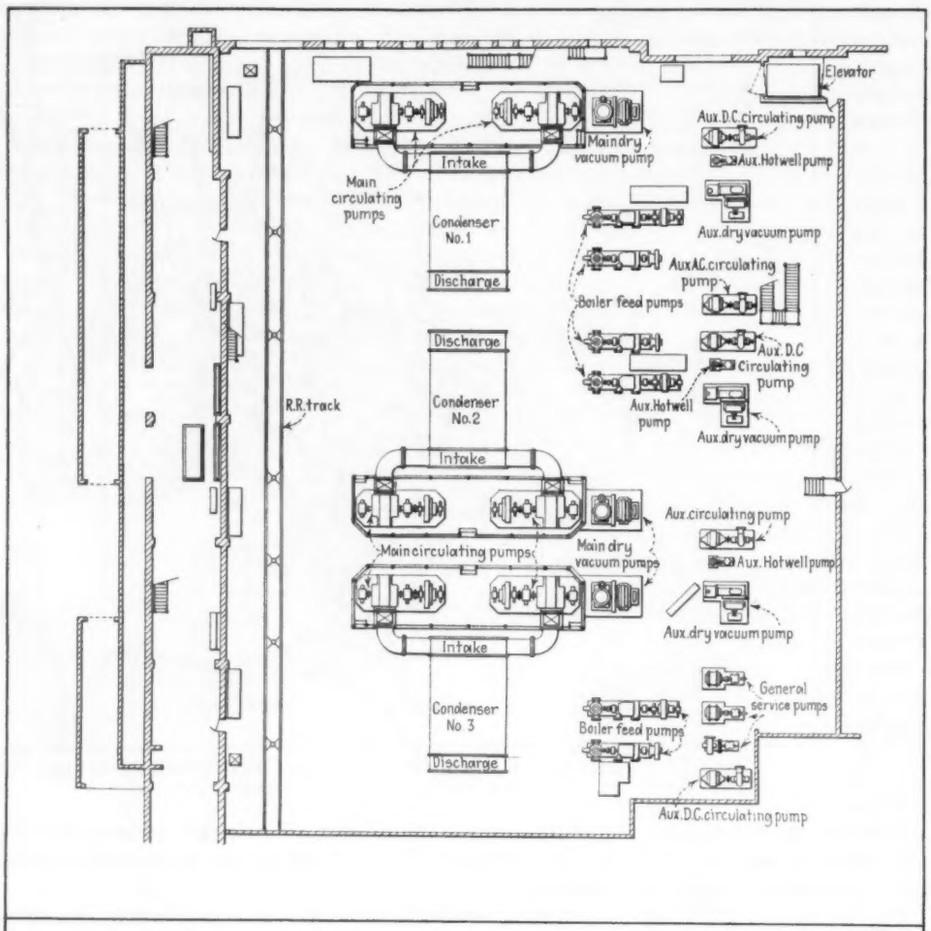


FIG. 5—BASEMENT-FLOOR PLAN IN TURBINE ROOM. AUXILIARIES ARE DRIVEN BY D.-C. MOTORS

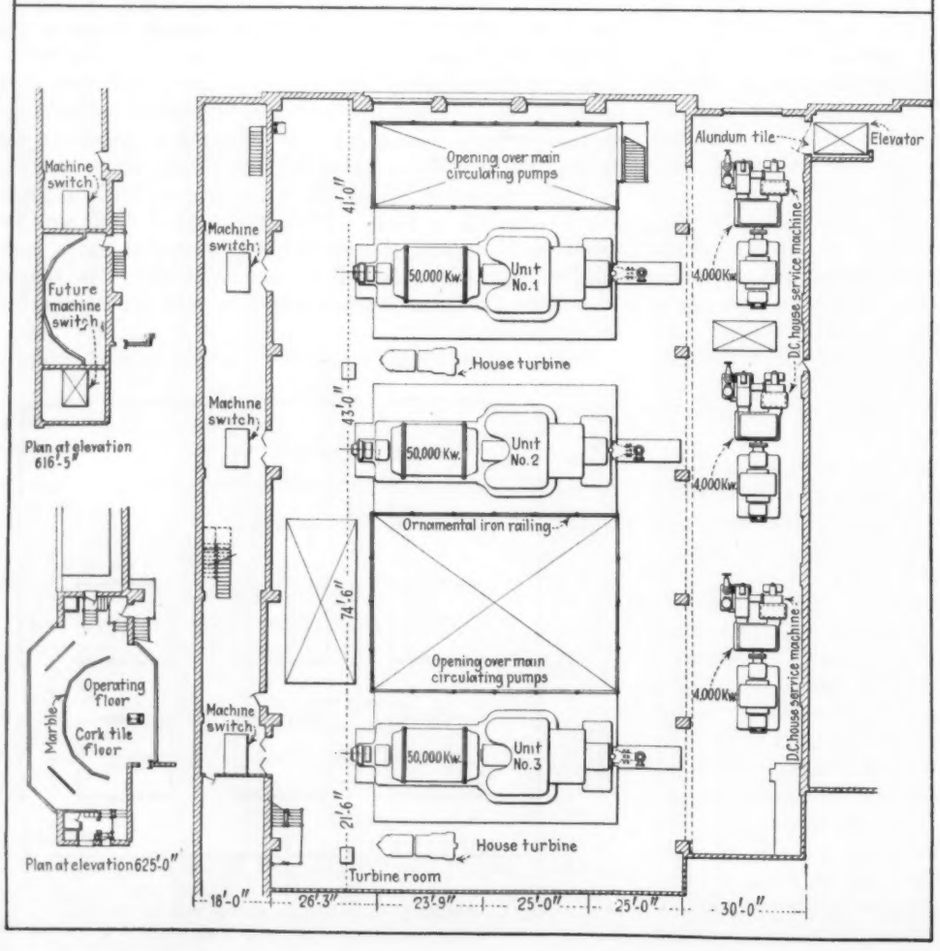


FIG. 6 — TURBINE-ROOM FLOOR PLAN. THREE OF THE SIX 50,000-KW. UNITS ARE NOW BEING INSTALLED

of decreased banking losses. Carefully conducted tests indicate that a substantial saving may be expected.

SUMMARY OF REASONS

To summarize, the reasons for deciding in favor of the pulverized fuel system were:

First — The calculated saving in annual operating expense with pulverized burning shows a substantial return to the added investment, even though based on a comparison between highly developed stoker practice on the one hand and the early experience with an imperfectly developed pulverized fuel plant on the other. There are some prospects of further improvement of pulverized-fuel-burning efficiency in the Trenton Channel plant, and it is reasonable to believe that the process of preparation will be materially cheapened in the course of a few years.

Second—A certain adaptability to coals of varying quality without impairment of reliability and efficiency is obtained. The range of variation here considered is that which experience shows may be met with in coal mined in a single field group over a period of several years, wherein the preparation given the coal at the mine is the most important factor governing quality.

Third — The reasonable prospect of being able to operate boilers satisfactorily at higher rates of steaming points to the possibility of installing fewer boilers as subsequent plant additions are made and of ultimately saving the cost of an entire three-boiler battery for the completed plant.

Serious consideration was given to the possibility of including the coal-preparation plant within the boiler building, but, on account of the operating difficulties involved in such an arrangement and the limitation which this would place upon green-coal storage capacity, the result was a decision to erect a separate building for the coal-preparation process.

The coal is received at the plant in cars and is dumped into the receiving hopper. From there it is carried by pan conveyors to the Bradford breaker, where all chunks of iron and wood are removed and the coal is broken to pass through a hole 1¼ in. in diameter. It is then elevated by bucket conveyors to the top of the green-coal-storage bunkers and distributed by a belt conveyor. This is practically the same system of handling which is used in the Connors Creek and Marysville plants. The coal then passes by gravity downward through the driers to the mills, where it is pulverized and exhausted into cyclone separators. Screw conveyors passing underneath each of the two lines of separators carry it to a receiving hopper placed just over the Fuller-Kinyon pumps, whence it is pumped to any one of the boiler bins desired. Duplex feeders (eight to each boiler) jet the coal through fish-tail burners and into the furnace. The duplex-feeder arrangement is a compromise between the group feeder, where all feeders are driven by one motor, and the single feeder, where each feeder has its own motor. With the latest type of underfeed stokers a certain amount of speed adjustment has been found desirable as between sections composing a group of rams, but individual adjustment between all rams is not necessary. It is believed that this arrangement of speed control should apply equally well to the burning of pulverized fuel.

DRIERS USED INTERMITTENTLY

Driers were considered a necessary item of equipment as a protection against occasional wet coal, which would, unless dried, cause serious difficulties if not an impairment of service. During the greater portion of the year the coal received contains only about 4 per cent total moisture. During the summer and fall months it may be less, but during the winter and early spring coal is sometimes received which contains enough moisture to cause trouble if not removed. Appreciating that there would be a rather low annual use factor of the drying equipment, an experimental drier has been built which shows promise of satisfactory development in the future.

This drier is of the modified Wood type. Instead of using the waste gas from the boilers, air is drawn through the lane of coal and is heated on its way by pipes or hollow louvers carrying steam bled from the house-service generators. Only when the coal carries considerable moisture will it be necessary to heat the coal and air, which means that during that portion of the year when the coal is reasonably dry some drying will be effected by merely sending through the driers warm air taken from the top of the boiler room. This will be a very cheap means of moisture removal, and when averaged in for the entire year, including the time when steam is used on the driers, the average cost of drying is expected to be comparatively low. With this type of drier there will be a minimum of fire risk, and the operator will be able to watch the drying process by merely patrolling the line of driers along the air inlet side. Ordinarily not more than one pound of air per pound of coal will be required, which will result in rather low air velocity so that very little coaldust will be withdrawn from the driers.

The furnace is large, having a free volume between the tube screens and the first row of boiler tubes of 25,140 cu.ft. The factors determining the shape and size are the total volume required, the vertical distance from burner arch to tube screen and the necessary space between the two opposite rows of burners to permit uncrowded downward movement of the flame and its reversal and upward flow in the middle of the furnace. The volume available for burning a given amount of fuel or the liberation of a given amount of heat is significant. Too great a rate of combustion maintained in a furnace will result in decreased efficiency and excessive maintenance. From present ex-

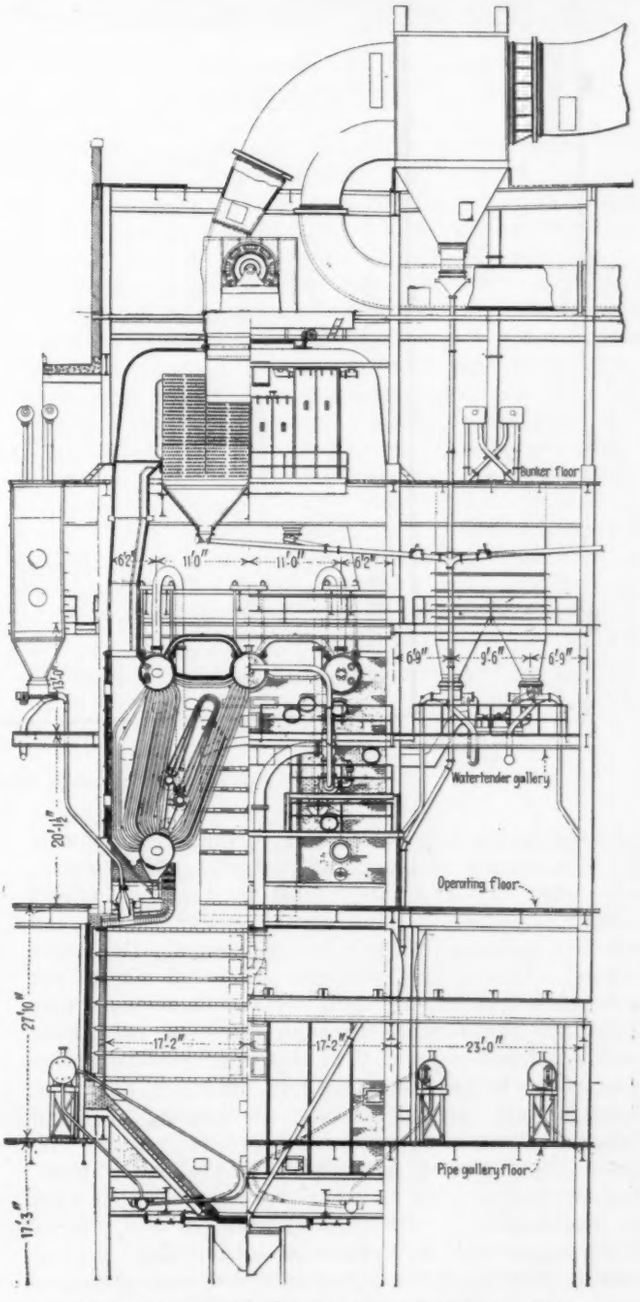


FIG. 7 — SECTION AND ELEVATION OF BOILER FURNACE, ECONOMIZER, INDUCED-DRAFT FAN, COTTRELL PRECIPITATOR AND BREECHING

perience it is impossible to predetermine the exact amount of coal which may be efficiently burned per cubic foot of furnace volume per hour. From tests which have been conducted the indications are, considering the quality of coal to be burned at this plant, that 1.7 lb. of coal per cubic foot per hour is on the safe side. The volume of these furnaces is such that when operating the boilers at 400 per cent rating there would be burned 1.71 lb. of coal per cubic foot per hour.

FURNACE WALLS AIR-COOLED

Practically the entire furnace wall is air-cooled for the purpose of protecting the refractories as well as to pick up heat which would otherwise be lost through radiation from the setting. The method of construction used makes possible repairs to the furnace lining with a minimum of labor and material. The furnace walls below the arch are cooled by the air induced through passages starting at the center of the end walls and running in a belt around virtually the entire furnace. This is the principal source of supply for combustion, and the air finds its way from these passages into the furnace through ports in the lining directly below the arch. The A-shaped portion of the furnace-end walls above the mud drums is also ventilated by air passing through an opening at about mud-drum level and moving upward by natural circulation to a take-off opening below the center drum. This warmed air will be picked up by the feeder fans and discharged into the furnace with the coal. From earlier experience with furnaces under this type of boiler it is believed that this part of the wall will cause trouble unless some means are provided for cooling the refractories.

The type W Stirling boiler, which was first installed at Delray in 1908 and later at Connors Creek and Marysville, was chosen for this plant because of the very excellent record it has established for reliability and low maintenance and also for exceptionally high economy, attributable in no small part to the size and shape of combustion chamber to which the type lends itself. The design was slightly altered to afford more heating surface and more space between mud drums, but it is essentially the same as that of the other boilers of this type. The baffling is arranged in a manner similar to the baffling in the Marysville plant. On the No. 10 tube—that is, the tube directly back of the superheater—is installed a metallic baffle developed by the Babcock & Wilcox Company. One such baffle was installed in a boiler at the Marysville plant with a resulting lower temperature of the exit gases. Because of the intimate contact between this baffle and the tubes to which it is clamped it does not become overheated, and experience indicates that it is superior to the old tile baffle for this particular location.

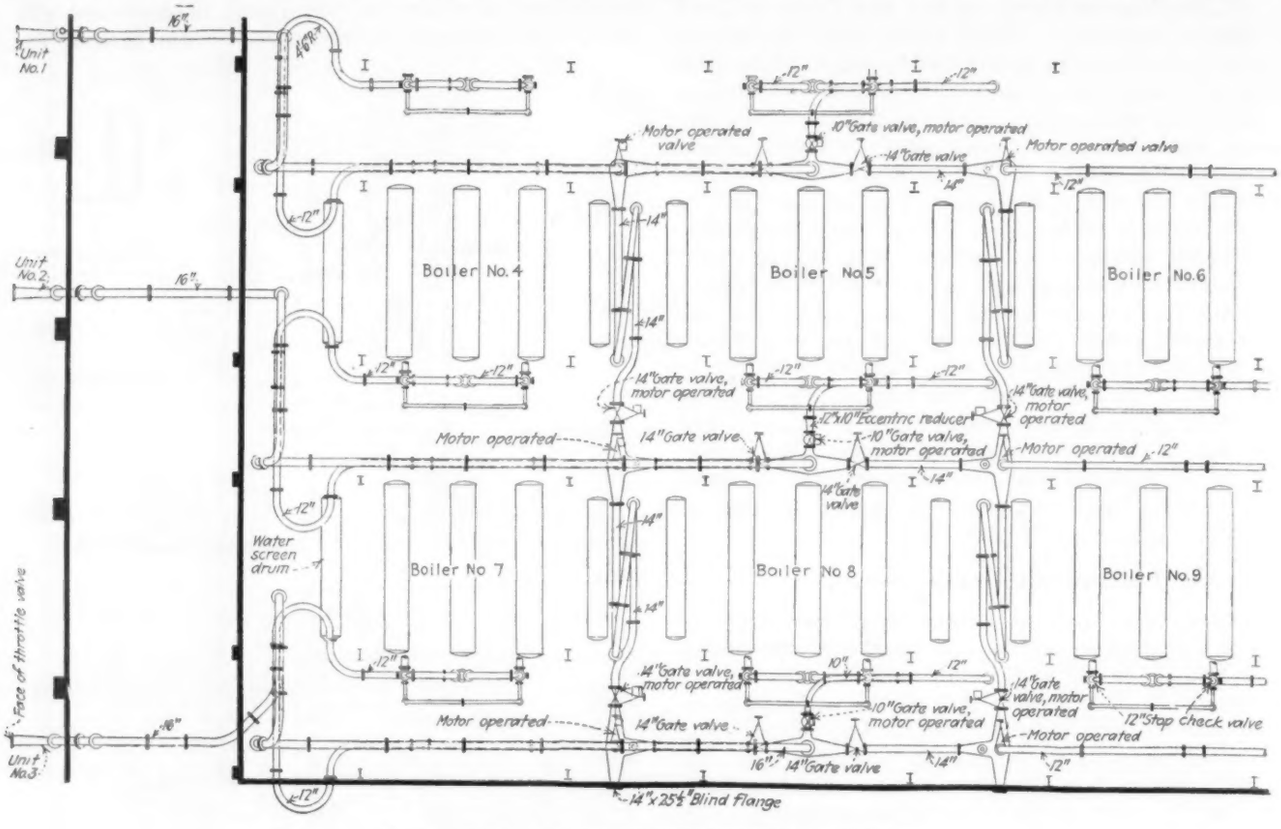
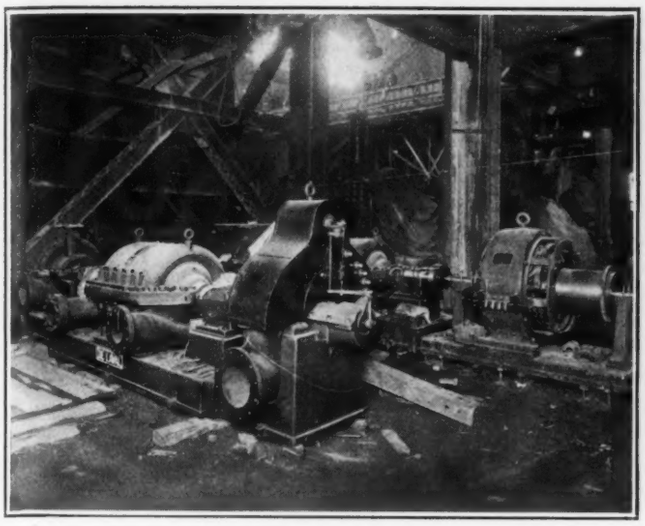


FIG. 8—PLAN OF MAIN SUPERHEATED STEAM PIPING

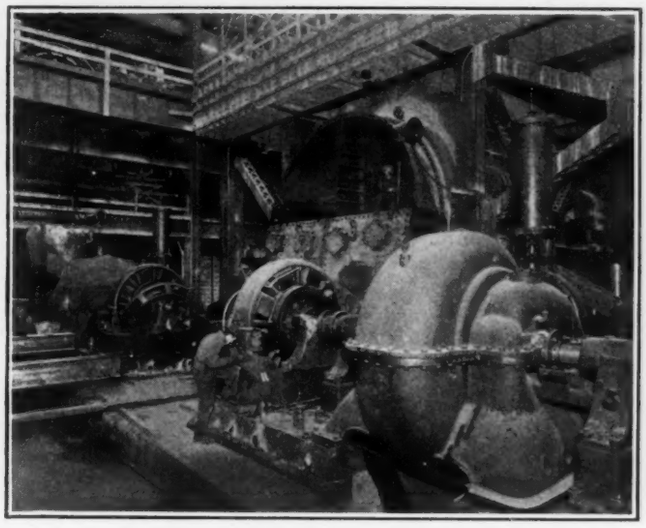
SUPERHEATER SURFACE 20 PER CENT OF BOILER SURFACE

The superheaters have relatively more heating surface than would have been necessary had stokers been used. This is because, owing to the presence of tube screens, a larger percentage of the total heat liberated by the combustion of the fuel will be absorbed in the combustion chamber by radiation than would be the case with stokers. Moreover, it is expected that combustion will be practically completed in the combustion chamber, no secondary combustion being available for increasing the heat transfer in the superheater passes.

The total superheating surface per boiler from which a final steam temperature of 700 deg. to 725 deg. F.



BOILER FEED AND HOT WELL PUMPS IN PROCESS OF INSTALLATION



CIRCULATING PUMPS AND CONDENSER IN PROCESS OF INSTALLATION

is expected is 6,070 sq.ft., or 20.7 per cent of the boiler-heating surface. This is nearly twice the ratio of superheater surface to boiler surface obtaining for the boilers in the Marysville plant.

With the higher boiler ratings which will be carried, economizers show a good return upon their investment cost and are therefore being installed. They are steel-tube economizers of the B. & W. type, two economizers with a surface of 9,425 sq.ft. each being installed over each boiler. Steel for both tubes and headers was chosen on account of the high boiler-feed pressure which will be imposed and also because of favorable past experience with the type.

TUBE SCREENS PROTECT AGAINST SLAGGING

For each boiler there are two tube screens extending across the lower part of the furnace. These tube screens are primarily to protect against slag formation at the furnace bottom, but at the same time their absorption of radiant heat reduces the average temperature in the combustion chamber, with a longer life of the refractories as a result. Fig. 7 shows the location of the tube screens with reference to the boiler. The one outstanding feature of this type is that it is made up of what are in reality two separate boilers whose water-circulating systems are entirely independent of each other and of the main boiler. Feed water from the economizers is fed into the two upper drums of the tube screens, the proper water level being maintained by means of Copes feed-water regulators in the same manner as in the main boiler. Steam generated in the tubes will find its way into the screen drum, whence it passes off through a 4-in. pipe and a stop-and-check valve to the center steam drum of the main boiler. This particular type of tube screen was devised as a measure of precaution against the possibility of damaging the main boiler should a tube failure occur in the tube screen. The form of tube screen employed in several other plants recently built is connected into the water-circulating system of the main boiler and

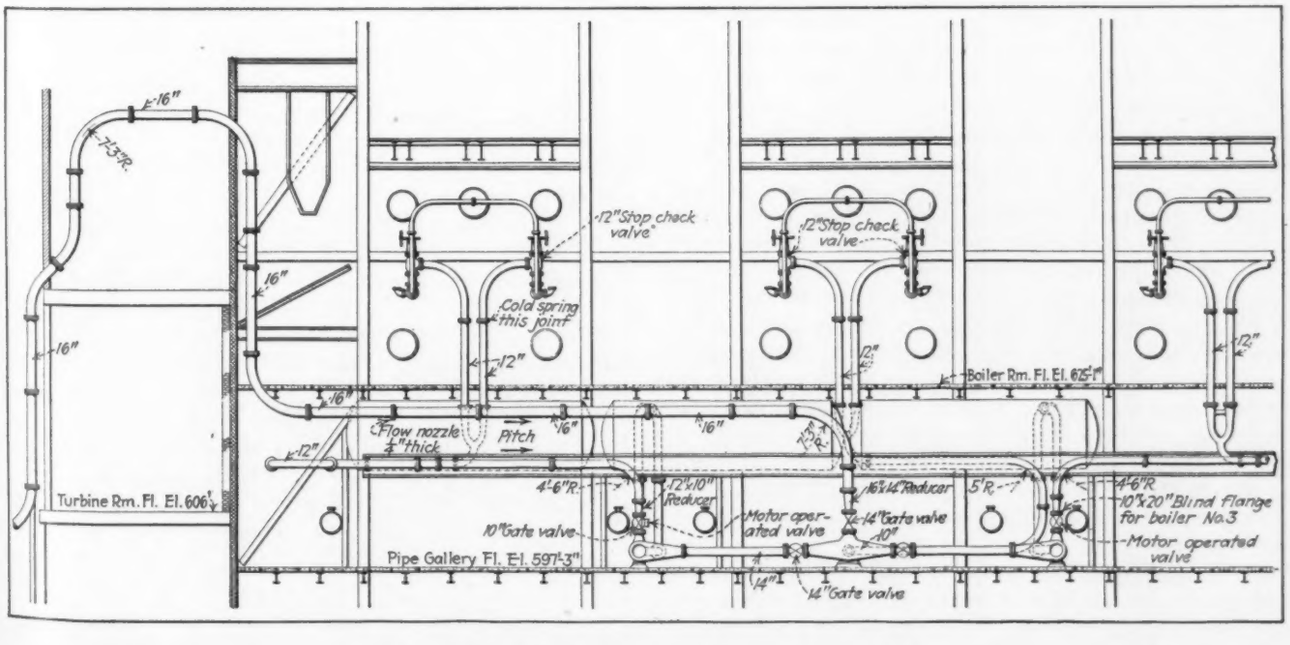


FIG. 9—ELEVATION OF MAIN SUPERHEATED STEAM PIPING

although more elaborate, is similar to the arrangement of waterbacks commonly used to protect the bridge walls of chain-grate stokers. The failure of a tube with such an arrangement may result in emptying not only the tube screen itself but the main boiler as well, with possible serious damage to both.

Each of the two tube screens contains 610 sq.ft. of effective heating surface, or a total per boiler unit of 1,220 sq.ft. From tests which have been conducted it is expected that this effective surface will operate normally at somewhere near 100 per cent rating, or the equivalent of 1,220 boiler-hp.

ASH DISPOSAL—COTTRELL PRECIPITATORS

With the furnace and setting designed as they are, a part of the fuel ash will be deposited at the bottom of the furnace and from there drawn into a sluice, from which it will be flushed as fill for low-level areas adjacent to the plant. Ash dust will likewise accumulate in the back passes of the boiler and in pockets

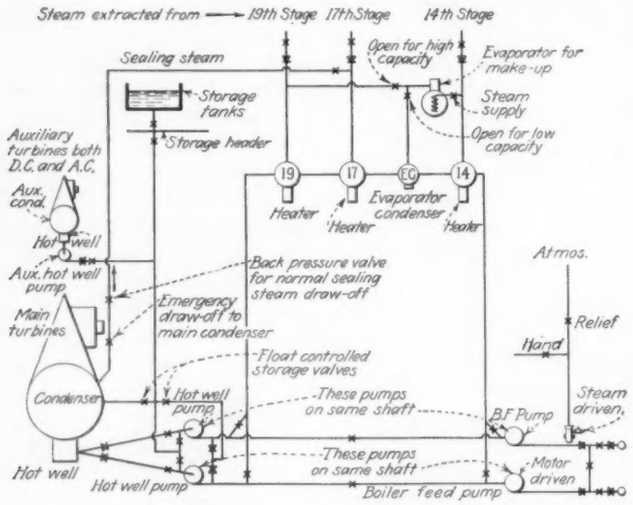


FIG. 10—FEED-WATER PIPING LAYOUT AND HEAT-BALANCE ARRANGEMENTS

under the economizer, all such pockets draining their contents to the ash sluice in the basement. The remainder of the ash, however—in fact, the larger part—will, if not caught, be carried off by the flue gases and discharged to the atmosphere from the stacks. There is some question whether or not this emission of finely divided ash will prove to be a public nuisance. In case it does two of the three stacks are having electrical precipitators of the Cottrell type installed in the breechings leading to them. In these high-tension unidirectional spark discharges from insulated rods to grounded plates cause the dust particles in the gases passing through to migrate to the plates and deposit themselves there until shaken off by mechanical rapping of the plates. In the third stack provision is made for similar apparatus if this is found desirable. The installation is in the nature of an experiment, no experience being as yet available with dust precipitation in boiler plants by this means, although the process has been very successfully applied in cement and chemical plants.

The precipitator is arranged in sections, so that each section may be closed off and the ash rapped down into a hopper, whence it flows by gravity to the ash sluice.

With turbine units of the size installed, the proper arrangement of steam piping presents a serious problem. Provision must be made for delivering large quantities of steam to the generating units from a combination of sources in the boiler room, and at the same time the piping must be sufficiently flexible to put no severe stress upon the turbine when expansion takes place. The general arrangement of main steam piping is shown in Fig. 8. It is all seamless-steel tubing having a wall thickness of $\frac{1}{4}$ in. Van Stone flanged joints are used throughout, great care having been taken in proportioning the flanges to withstand, without distortion, the severe stresses set up when the joints are bolted tightly enough to be steam-tight against 400 lb. All valves and fittings are of cast steel to withstand the high pressure and temperature. The expansion will be taken care of by bends and loops designed according to formulas experimentally developed from a series of tests being conducted by Sabin Crocker and Sterling Sanford.* These tests were begun in 1921 and the original formulas have been varied from time to time as more experimental data have become available.

At certain points motor-operated valves are installed which may be closed by operating switches at a control station on the bridge between the turbine room and the office building.

TURBINE-ROOM ARRANGEMENTS

The turbo-generators are arranged with their shafts crosswise of the turbine room, with the turbine end toward the boiler room in the same manner as at Connors Creek. The first three units will have a maximum rating of 50,000 kw. each at 80 per cent power factor and are a development of the 1,200-r.p.m., 45,000-kw. machine now in service at Connors Creek. Within the range of the governor, however, the machines will deliver only 43,000 kw. In order to obtain an output greater than this it will be necessary to open manually the overload valve which admits high-pressure steam to the fifth stage of the turbine. When the entire six units are installed the total additional capacity available in this plant within the range of the overload valves amounts to virtually the capacity of one turbo-generator or the equivalent of one spare unit.

FEED-WATER HEATING BY BLEEDER SYSTEM

Steam will be extracted from three stages—the fourteenth, seventeenth and nineteenth—for the purpose of heating the feed water. A combination hot-well and boiler-feed pump removes the condensate from the condenser and pumps it through the heaters and economizers to the boilers. Neither the stage bleeding nor the combination pump with its greatly simplified piping arrangement and operating features is a new departure, as both have been in successful use at the Delray plant for many years. The combination pump is really two pumps mounted on the same shaft, one a hot-well pump and the other a boiler-feed pump. There will be two of these pumps for each main unit. One will be driven by a direct-current adjustable-speed motor and the other (a standby) by a steam turbine.

The general piping scheme is shown in Fig. 10. With this closed system of condensate and feed-water piping there is little opportunity for the water to pick up any air.

*For report of the earlier results of these experiments see "The Elasticity of Pipe Bends," by Sabin Crocker and Sterling Sanford, presented at December, 1922, meeting of the A. S. M. E.

Earlier experience indicates that condensate as first pumped from the main condenser contains fewer dissolved gases than at any other point in the feed-water system, the condenser itself constituting an effective de-aërator. Further equipment for de-aërating is omitted for the present, but may be installed later if necessary.

Means are provided for taking care of the difference in the quantity of steam condensed in the condensers and the water required for feeding the boilers. At times of increasing plant load, when the boilers demand less water than will be available from the condensers, a float-controlled valve coming into action will permit water which has passed through the hot-well section of the combination pump to pass off, before going to heaters, there being one evaporator for each main turbine. Part of the steam extracted from the fourteenth stage of the turbine is sent to this evaporator and the resulting vapor condensed in a surface condenser or heater forming one of the series of stage feed-water heaters. Provision is also made, if occasion arises, for turning the evaporator vapor into the nineteenth stage (or lowest-pressure) heater and by this means doubling the temperature difference between steam supply and evaporator vapor and consequently virtually doubling the rate of make-up supply.

It is quite common practice where bleeder heaters are used to take the auxiliary electrical energy from the main generators or station bus. However, at this plant as far as auxiliary energy is concerned, the main

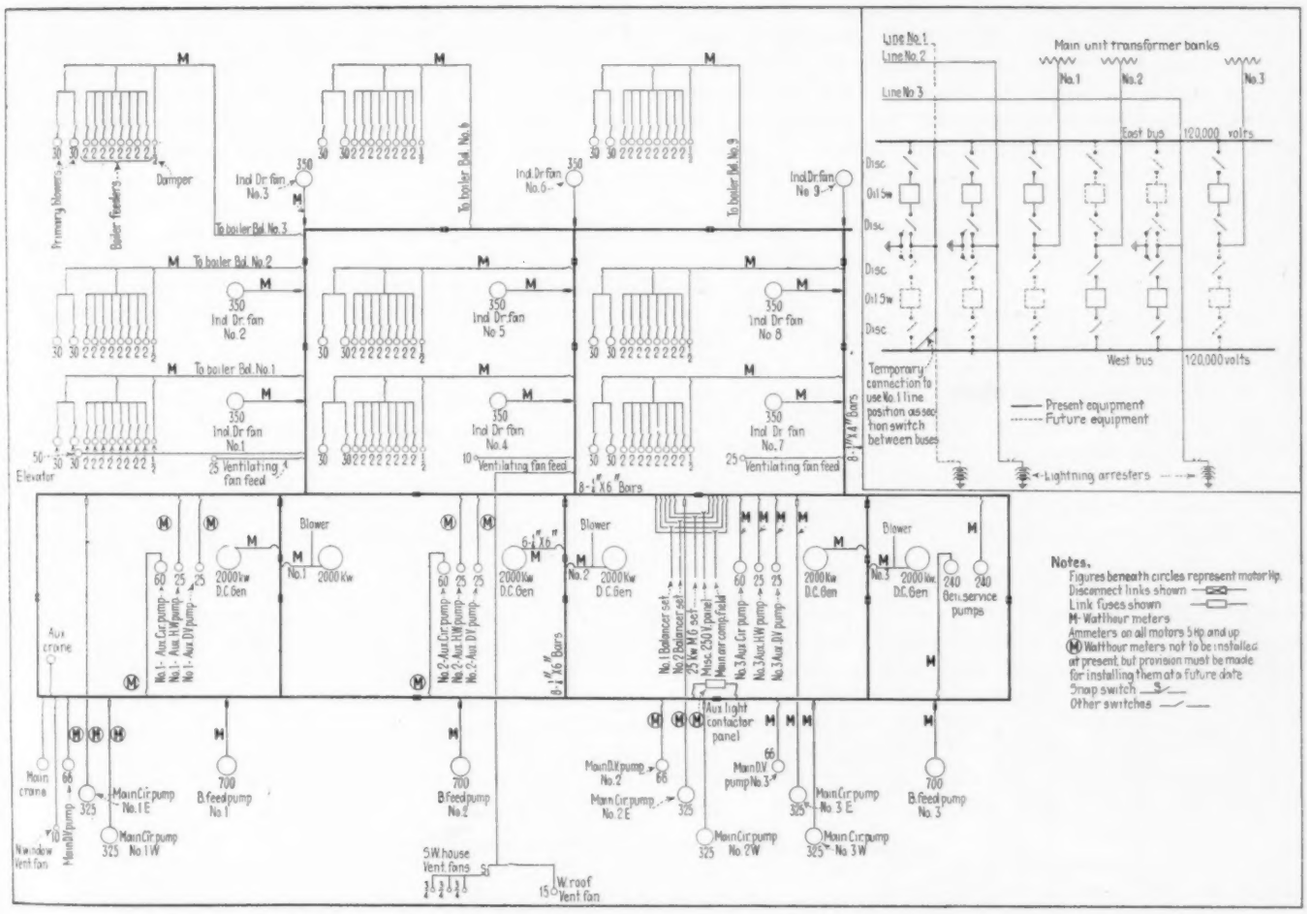


FIG. 11—LINE DIAGRAM OF RING-BUS AUXILIARY SUPPLY. FIG. 12 (UPPER RIGHT)—CONNECTION DIAGRAM OF THE 120,000-VOLT OUTDOOR SWITCHING STATION

the heaters, to the storage tanks in the transverse aisles of the boiler-room pipe gallery. The water in these tanks will be steam-blanketed to prevent the absorption of air. At times of decreasing plant load, when the boilers demand more water than is available from the condensers, the float valve will operate to allow stored water to enter the hot well of the main condensers, where it becomes available for boiler feed. Upon being admitted to the main condensers this water is subjected to the high vacuum so that any air which it may have absorbed while in storage will be immediately given up. The entire system of condensate and feed-water pumping has proved entirely reliable in past experience, and its simplicity will tend toward a saving in operating labor.

Make-up water will be evaporated in single-stage evaporators interconnected with the stage feed-water bus has no connection in the plant for the following reasons:

1. It is a 120,000-volt transmission bus and may be subject to voltage variation as dictated by distribution requirements.

2. The cost of step-down transformers and circuit breakers required for a connection between the auxiliary system and 120,000-volt station bus would be disproportionately high, and, taking into consideration the fact that a portion of the effective capacity of main generators, generator transformers and switching apparatus would be thus absorbed, it proved much less costly to provide self-contained auxiliary turbo-generators exhausting to high-vacuum condensers, affording at the same time an independent source of energy in case of system trouble.

3. It seemed dangerous to parallel on the low-tension

side of the machine transformers because of the possibility of current interchange.

In view of the large number of plant auxiliaries requiring speed control, the simplicity which direct current affords in obtaining speed control and the sustained efficiency of direct-current motors at light load, it was decided to make all essential auxiliaries direct-current-driven. This conforms with practice at both Connors Creek and Marysville, where experience has shown that this form of supply is satisfactory and reliable. To supply this direct current steam-turbine-driven direct-current units are being installed. The turbines exhaust to their own surface condensers and will give as good economy as could have been obtained from the main alternating-current bus by using transformers and converters.

For driving the coal-handling and preparation equipment, where no speed adjustment is required, alternating current is used in preference to direct current. Literally continuous operation of this equipment is not necessary for the uninterrupted operation of the main plant. Furthermore, the requirements are very similar to those of the ordinary commercial primary service supplied to large customers on the company's lines, while 2,300-volt motors lend themselves very well to this class of service.

To supply this power alternating-current house turbo-generators are installed, because it was found to be cheaper from an investment standpoint to do this than to absorb the capacity of the main system. A standby service of limited capacity is provided by means of an outside connection to the transmission system. The cost of the standby service is insignificant compared with what it would have been if the entire supply had been taken from this source.

MAIN ELECTRICAL SYSTEM

The main generators are provided with closed air-circulating systems. Air coolers of the General Electric type will receive water from the main circulating pumps, no attempt being made on more than one unit for the present to absorb the heat loss by circulating turbine condensate because of a reluctance to complicate the system.

The generator voltage is nominally 12,200. Each generator will be connected through a 25,000-volt, 400-amp. machine switch to a bank of three single-phase transformers just west of the switch-control gallery.

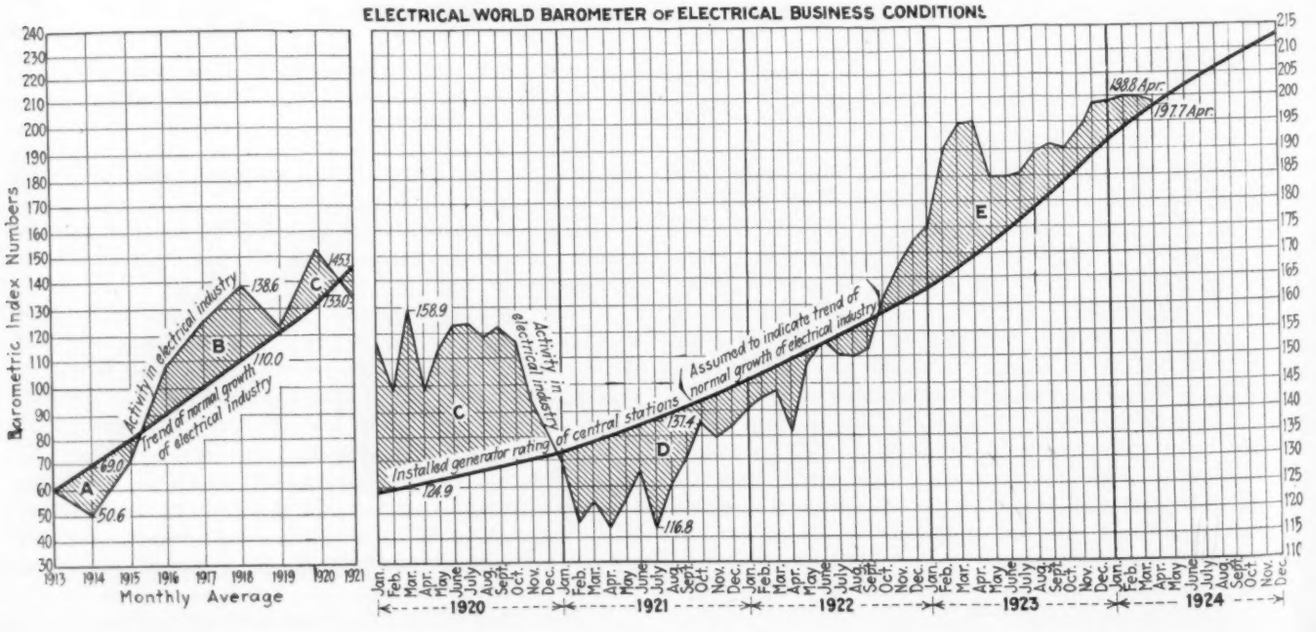
Between the transformers and the 120,000-volt bus are the full-automatic 132,000-volt, 400-amp. outdoor-type oil circuit breakers. These breakers are installed on the mat just west of the building and are so arranged that any machine may be connected to either section of bus. For synchronizing the unit the machine switch will be used because of its quicker action.

April Business Activity 1.1 per Cent Above Normal

FIGURES on which the "ELECTRICAL WORLD Barometer of Business Conditions in the Electrical Industry" are based indicate that activity within the industry in April was slightly less than during March. All the basic industries, with the exception of copper production, showed slightly less activity during April than in March.

A decrease of six-tenths of a point on the barometer scale, as compared with March, is shown. During the interval the industry has grown 1.5 points, making a net decrease in activities of 2.1 points on the barometer scale as compared with March. The electrical industry as a whole was operating in April at 1.1 points or per cent above what would have been the point of seasonal demand if growth in the industry had been normal. In March (revised) it was operating at 3.2 and in February at 6.6 points or per cent above the point of normal demand. Incomplete reports indicate that the electric light and power branch of the industry was operating at 4.3 per cent above normal during the month of April.

While there has been an economic depression in industrials in general, yet it is noticeable that the electrical industry as a whole has been influenced by this depression far less than other industries. The consensus of opinion as expressed at the recent Atlantic City convention was that it is questionable whether the volume of business in the electrical industry as a whole has materially decreased, for although industrial lines have suffered other lines are very active.

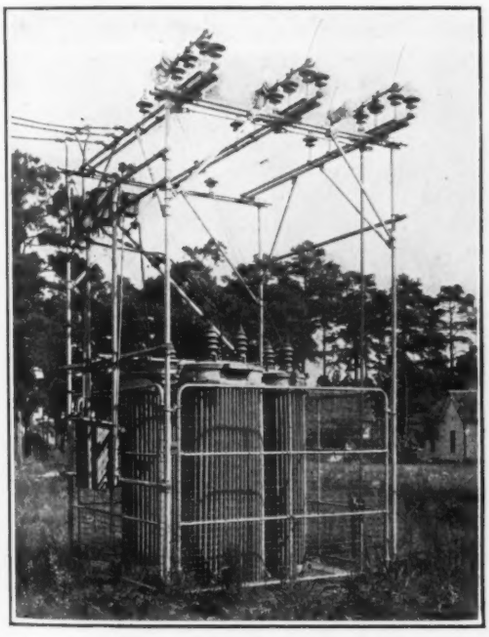


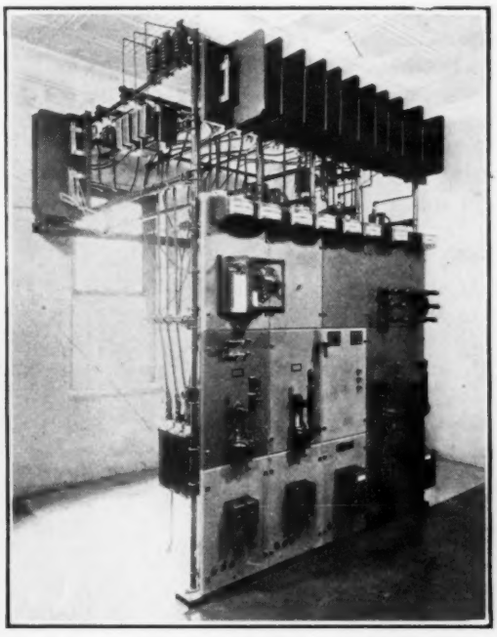
The "Electrical" South

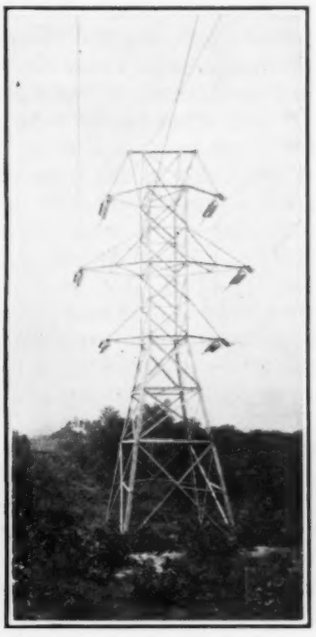
A Glimpse of North Carolina and Revelations that It Brought—Economy Engineering and Intelligent Merchandising Have Produced Remarkable Results—No Such Thing as Saturation

By OBSERVER

NORTH CAROLINA is in the heart of the "old South" and to the average man in other parts of the country is frequently associated with conceptions of a country where the Civil War atmosphere still lingers and where people occupy themselves with the social and business pursuits of older days. Such conceptions are utterly wrong, and in no part of the country have greater developments occurred, if impressions gained by a visit to Raleigh and vicinity can be taken as evidence. Direct from New York, I dropped off in Raleigh and went to a new and modern hotel which was crowded with guests. The capital city is well lighted, has many new business buildings and homes under construction and houses its state officials in fine new edifices.







LEFT—SMITHFIELD SUBSTATION, RATED CAPACITY 600 KW., 22 KV. CENTER—SWITCHBOARD IN REAR OF STORE, DUNN, N. C. RIGHT—100-KV. DOUBLE-CIRCUIT STEEL-TOWER LINE NEAR SANFORD, N. C.

It is, besides, the heart of the Carolina Power & Light Company's system, with its 840 miles of high-tension lines and 50,000 kw. peak load. This company has grown in a few years from a small property into a large system which has done splendid work in bringing about the changes in business and living conditions in its territory. It has developed because it has had the vision to adopt engineering practices and merchandising policies that fit service requirements, and I can give no better picture of it than by recounting my experience on a trip by automobile around a part of the system.

Leaving Raleigh in the morning, I visited the new steam station on the Cape Fear River. This station is at the heart of the system, has plenty of circulating water and a good delivery route for fuel. It has a 15,000-kw. unit in operation, and another is expected to be in service by September. Ultimately four units will be installed. By means of a good design the building is extended by duplicate sections as new units are required. In the interior space economy, good light and economical but adequate construction typify the station. The generator leads run direct to outdoor transformers, where the energy is stepped up to 100,000 volts and goes to an outdoor substation on the main 100,000-volt line in that territory. This outdoor substation is equipped with breakers and disconnecting switches only and uses a minimum number of insulators. It is simple, compact and has ample clearance so that it can be readily maintained.

Leaving Cape Fear, my companion and I traveled over splendid roads to the small town of Sanford, where a tap from the 100,000-volt line is made on the outskirts and 2,300-volt energy is supplied to a small station in the rear of the company office. In the rear of the office are the switchboard, the regulator, the street-light transformer and the meter and repair department. The front office is equipped with wallcases filled with merchandise, and appliances of every character are exhibited on the floors. The local manager was much chagrined that his office was somewhat out of order because he was having the windows remodeled and floors varnished to secure a better display effect. He is proud of the office and of his record, for in this small town of between three and four thousand people the sales of merchandise exceeded the sales of energy during the past year.

Driving further through a prosperous farming territory, we arrived at the town of Dunn, where my eyes were opened still wider at the possibilities of business in a place of 3,500 people. The business district was two blocks long and was built of new and substantial brick structures. I observed that window displays were good and that X-ray reflectors seemed to be favored, and I was told that 75 per cent of the stores now used X-ray window lighting and that twelve electric advertising signs were used, although no signs and only a few drop lines existed two years ago, when the Carolina Power & Light Company first supplied the town with energy.

Then we parked the car and went to the local office. It was in about the best position on the street, had a new awning in front, was of brick and had display windows with oaken floors. In one window were a fine dining table and chairs, and on the table were the usual appliances. In the other window vacuum cleaners were displayed in a very attractive manner.

WHAT INTENSIVE MERCHANDISING HAS ACCOMPLISHED

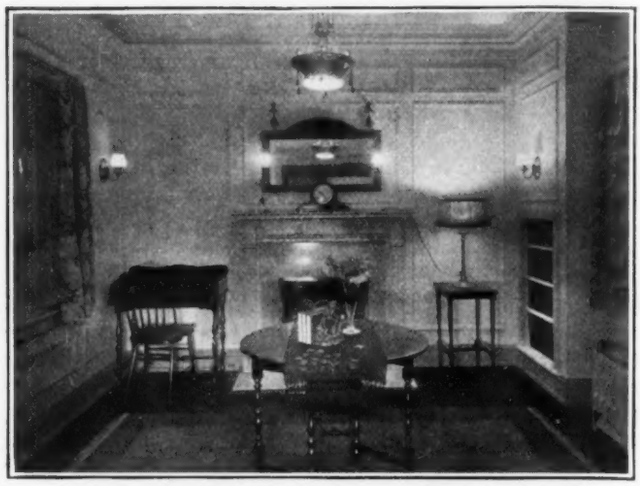
Upon entering the store the impression gained was that one was in a real place of business whose manager had good taste. Good light with plenty of color gave a warm effect to the reflections from the appliances in the large oak cases along the walls and on the floors. A glass case in the center of the floor must have come from a jeweler and furnished a splendid setting for the glittering appliances placed on the velvet-covered shelves. A row of ranges along the wall looked ready for operation, and in several places vacuum cleaners were ready for inspection. On a good oak table other appliances were available. Not the least attractive feature was the floor with its dark-brown and white squares of special covering.

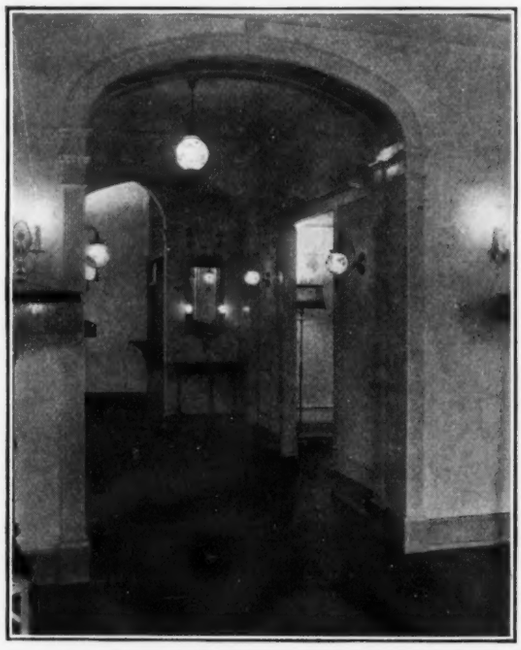
Then in a small alcove off the main room I saw some illumination booths that would sell lighting to the most obdurate. For example, in one booth the curtain was drawn back and I faced a mantel with a glowing electric log in the fireplace and candlelights at proper locations. Near the mantel was a floor lamp and comfortable furniture, while candlelights on other walls and indirect lighting unit overhead gave color and warmth to the whole.

Here is a list of some of the things sold in this little town during the last two years: fifty electric ranges, 275 vacuum cleaners, 600 flatirons, fifteen waffle irons, 125 special kitchen-lighting sets, sixty-five 200-watt "Duplexilite" units, twelve 3-kw. water-heater units, twenty-five washing machines and twelve electric sewing machines.

Is it any wonder that the revenue from merchandising sales was 20 per cent greater than that from energy sales during 1923? Then I said: "Well, didn't you use intensive methods, and aren't you about saturated?" The local manager smiled broadly and replied: "Our business for the first two months this year is ahead of last year, and we have hardly started sales work; there is no such thing as saturation, according to my experience." These things were sold by the local manager and one salesman, supplemented by one or two salesmen sent from Raleigh at times during certain campaigns on ranges, cleaners or washing machines; but no extraordinary attention had been given to the merchandising in this one city by the system merchandising staff.

As to rates, they will average around 10 cents for lighting and 4 cents for ranges in the town of Dunn, and strange to relate, there is no industrial load. It is a purely residential and business town in a farming country, yet it shows possibilities, for, while the output in January, 1923, was 50,000 kw.-hr., that in January,





ARRANGEMENT OF MODEL ROOMS IN RALEIGH OFFICE, WHERE DIFFERENT LIGHTING EFFECTS ARE DEMONSTRATED

1924, was 136,000 kw.-hr. While the merchandising was gaining rapidly the lighting staff also had increased business, gained by surveying unwired homes and wired homes and getting modern lighting installed. Every phase of activity had received attention with results that showed very positively.

For example, very recently delegates from a municipally operated property visited Dunn to look over the city and left with this remark from several citizens ringing in their ears: "We did well when we quit the municipal system here and gave the job to the power company. The company knows its business and has done wonders."

I observed the usual repair and supply department in the rear of the store, the switchboard, regulator and street-light transformer, and then visited a small substation in the outskirts where a 22,000-volt line was stepped down to 2,300 volts and then ran to the city. This substation was near the railroad and near where any incoming industry would locate and was ready for developments. It was made of pipes and pipe fittings capable of being assembled or dismantled very readily and contained nothing but the three transformers, "disconnects" on both sides and fuses on the low side. A wire fence surrounded the pipe frame. This type of substation has been found best for supplying small towns throughout the territory and for giving service to gins, cotton mills and other industries.

Upon leaving Dunn we passed over more miles of good roads and through other towns of a similar character and arrived back in Raleigh after a trip of 130 miles with many stops. North Carolina has spent about $65,000,000 for good roads in the past few years, and these roads play an important part in bringing about the changed conditions.

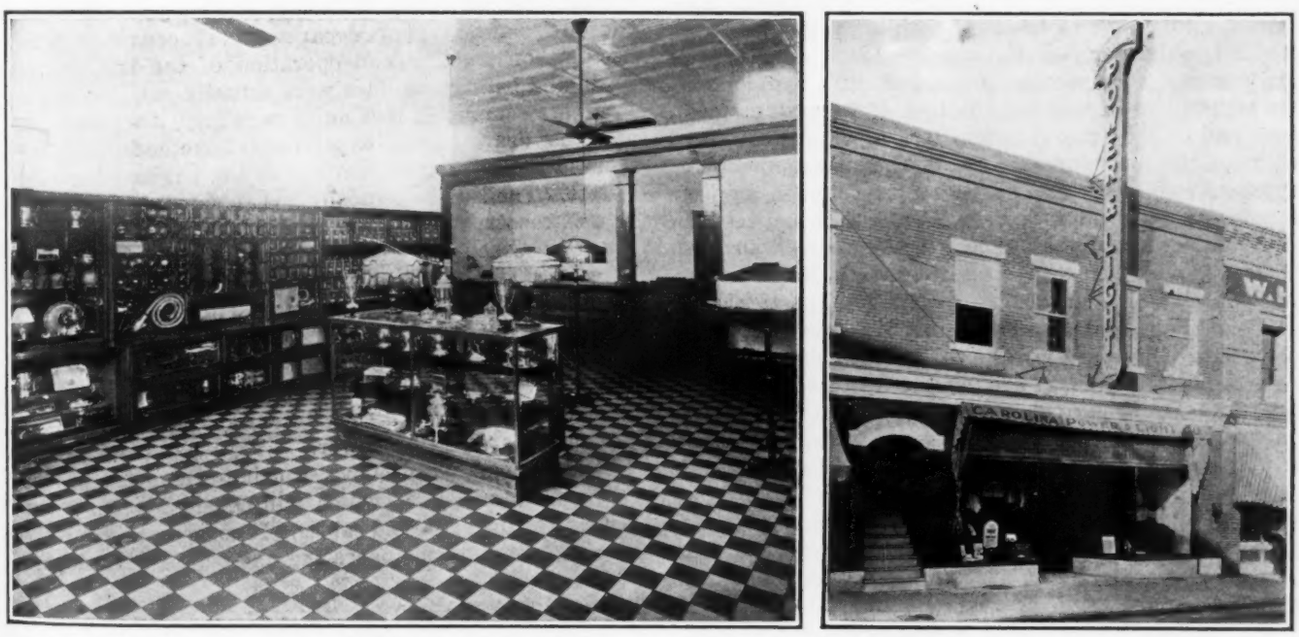
The Carolina Power & Light Company has made the small-town business pay dividends, and other properties should be able to profit by its experiences. The fact that merchandise sales exceed energy sales is significant in this type of service. A goal of $16 per year per customer should be obtained in small towns through appliance sales. And the secret of success lies in having a competent headquarters staff and a local manager who can give service, produce good will, create business and help finance company activities through security sales. A real office and display rooms, established in a prominent part of the town, is another necessary asset.

Committee Form of Administration for Large Company

Its Use in Functioning of Southern California Edison Company—Methods for Formulating Plans and Decisions by Each Group

BY HAROLD E. BARDEN
Engineer Southern California Edison Company, Los Angeles, Cal.

AS PUBLIC utilities increase in size the problem of efficient management and careful planning to produce the best service and the most economical utilization of time and material becomes increasingly important. It has been found by the Southern California Edison Company that one of the most effective means of accomplishing results is through a committee form of organization. Such a set-up as that shown in the accompanying chart has been used with gratifying success during recent years.



INTERIOR AND EXTERIOR VIEWS OF COMMERCIAL OFFICE, DUNN, N. C.

Members of these committees are composed of the men most concerned with the problems to be handled, and as there is a free interchange of ideas between the men of the same department and between different departments, the best judgment, opinion and practice are obtained through a correlation of these ideas and a general discussion of a problem. This helps not only in solving unusual engineering and operating problems, but in ironing out difficulties among the personnel and in strengthening the *esprit de corps* of the organization.

The various committees have gradually come into existence as the necessity for them arose, and their number will continue to increase with the growth of the company. The engineering committee is one of the oldest, having first functioned in 1912. The accident-prevention committee has been meeting since 1914, and the 220-kv. committee was formed in 1920. Aside from

the management and finance committees, most of the others came into being during the year 1923.

The general policy of the company is controlled by the board of directors, which meets twice each month. The president of the company is the chairman of the board of directors, the finance committee and the management committee. The finance committee, which meets every two weeks, alternating with the meeting of the board of directors, is composed of several members of the board and two or three prominent business men not members of the board of directors. Most of the details regarding finance are handled by this committee, and the members are often called together for special meetings. The management committee meets weekly in the president's office, and its members consist of the president, vice-president, general counsel and secretary. This committee receives and acts upon the recommendations from each general department, including the action to be taken on legal questions. The committee defines the policy as established by the board of directors and decides upon executive matters in every branch of the business. One of its most important functions is to discuss and decide upon questions of public relations.

ENGINEERING COMMITTEE

The engineering committee meets regularly each week and is presided over by the manager of operation. This group is composed of heads of each department coming under the direction of the vice-president in charge of engineering, construction and operation. The committee acts upon the recommendations of its various members and of the several committees reporting to it and submits its recommendations to the management for approval. While most of the work handled by this committee is of an engineering nature, it can be seen from the diagram that a very broad field is covered, including everything in connection with the construction or rehabilitation of the operating properties.

While the planning committee is composed largely of the heads of the divisions of the operating department, several of its members are representatives from other departments of the company. The function of this committee is to discuss and make plans for the construction of new substations, transmission lines and various necessary additions to the operating properties found essential for the continuance of good service and to meet the growth of the system. Regular meetings are held monthly and are presided over by the assistant manager of operation.

The look-up committee is a special committee made up of five representative members of the planning committee. It meets once each week. These men analyze the situation surrounding each problem submitted to them and report their findings to the planning committee. It has been found that this is a much more expeditious and efficient means of obtaining results than from a general discussion by a large group.

The progress committee meets twice each month and discusses the progress made on work that has been outlined by the planning committee. Its mission is to expedite drawings and materials and to straighten out difficulties which may arise among the departments concerned so that the date set for the completion of a job may be successfully met. Members of this committee are chosen largely from the engineering and construction departments along with several representatives of the operating department. A construction job program is prepared fortnightly in diagrammatic form by this committee, which shows at a glance the location and description of the property, the date drawings are promised, length of periods of construction for both steady and intermittent work, the date the new equipment should be ready for operation and per cent of completion. There is also a column of remarks in which is placed any pertinent information such as causes of delays, etc.

The communication committee, composed of seven representatives from the operating, construction and engineering departments, is presided over by a member of the executive engineer's department. This committee meets as often as necessary and discusses ways and means for the most efficient development of the communication system, which includes the company's private telephone lines and radio stations. Its function is similar to that of the look-up committee, except that it concerns itself with communication problems only.

The 220-kv. committee was organized in 1920 for the purpose of investigating in detail the problems of 220,000-volt transmission. This committee, under the supervision of the executive engineer, has solved many of the problems connected with the change-over of the Big Creek lines from 150 kv. to 220 kv., and many of its members have contributed valuable data and methods to the industry by their research in the field of high-voltage transmission. Members of this committee are chosen from the various departments concerned with the design, construction and operation of the 220,000-volt lines, and before the lines were actually put into operation this committee met quite regularly, discussed conclusions drawn from experimental methods and forwarded their recommendations to the engineering committee. The Edison company has announced its expectation of constructing two more 220,000-volt circuits from the Big Creek project in central California to Los Angeles. These will traverse an entirely different route from that of the present lines. This committee will therefore continue to function, handling not only problems of design and construction, but also the selection and securing of the proper right-of-way and the location of a suitable receiving substation for the distribution of a large amount of power.

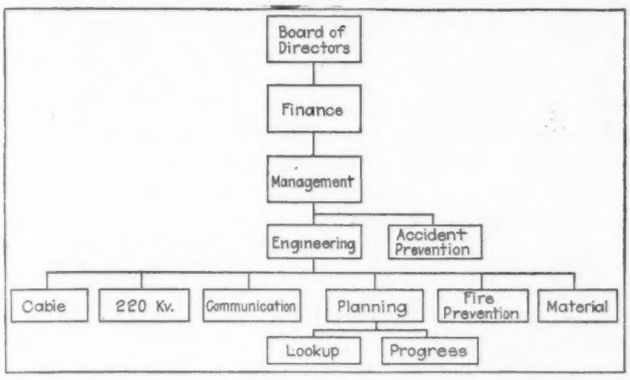
In addition to the above, a cable committee has recently been organized which will consider all problems relating to underground cables. It consists of five members representing the operating and engineering departments.

GENERAL COMMITTEES

The accident-prevention committee reports directly to the management and includes representatives from practically every department of the company. There is a sub-committee at Big Creek, center of the company's hydro-electric plants, which meets regularly and acts upon the many problems arising in connection with the large construction projects in that territory. The functions of the accident-prevention committee as a whole, the committee meeting every three months, are to discuss all accidents, their causes, the means of their prevention, and also general policies, which are then recommended to the management for approval. Attention is called to conditions of possible hazard on the system, and these are referred to the proper department for correction. Means are discussed for educating the employee, stimulating his mind to the realization of existing dangers and instilling into him the idea of "safety first." There is an executive committee within

the accident-prevention committee, consisting of five members, which meets at least once a month and which may be called together by the chairman as often as necessary. This sub-committee carries on the routine business, such as investigating and reporting to the management all serious and fatal accidents and preparing and submitting monthly a classified report of them.

The material committee was organized to investigate the slow-moving material held at company store rooms. An effort is made by this group, consisting of representatives from several departments, to determine the



COMMITTEE FORM OF ORGANIZATION OF SOUTHERN CALIFORNIA EDISON COMPANY

feasibility of using apparatus or material on hand, to determine which department can best use it, and to ascertain what material should be sold or junked. This committee, under the chairmanship of the general storekeeper, meets twice each month.

The fire-prevention committee consists of representatives of the engineering, operating and insurance departments and is called together whenever necessary by the chairman, who is a representative of the executive engineer's department. Its duties are to select the proper fire-fighting equipment, to inspect old and new stations, to recommend the removal of fire hazards and as far as possible to eliminate all causes of fire.

Letters from Our Readers

A Place Set Apart for Suggestions, Comments and Criticisms, to Which All Men of the Electrical Industry Are Cordially Invited to Contribute

Economy of Multiple Street-Lighting System at Minneapolis

To the Editors of the ELECTRICAL WORLD:

Under the heading "Small-Plant Problems at New Orleans," the report of the Southwestern N. E. L. A. convention which appeared in your May 3 issue, I notice that several points were brought up regarding the multiple street-lighting system recently installed at Minneapolis which I should be glad to clear up.

One question raised concerned the reliability of the control relays. While the type of relay we use is a new development and hardly out of the experimental stage, it is giving very reliable service. This is indicated by the fact that the lamp-hour outage on the multiple system is running only about one-third that on the older series circuits.

As to the multiple system being limited to use in congested districts, this is very far from being the condition. It is being applied in very sparsely settled rural districts with even greater economies than in the congested districts. In fact, we have converted a number of our former suburban and rural series circuits to multiple and have shown net gain on the cost of cutting over—that is, the saving exceeded the material and labor cost for conversion.

In our opinion the multiple system will be found infinitely superior to the more standard series system in any location where there is a demand for residential or commercial service from the same pole lead, and there will very rarely be conditions where this requirement does not exist.

S. B. HOOD,
Superintendent of Distribution.
Northern States Power Company,
Minneapolis, Minn.

Relation of Pupillary Aperture to Brightness Stimulation

To the Editors of the ELECTRICAL WORLD:

I read with much interest an editorial entitled "Lighting and the Pupil of the Eye," on pages 812-813 in the April 26 issue of the ELECTRICAL WORLD. The relation of pupillary aperture to brightness stimulation is not generally understood, and the reasoning in the editorial referred to is the popular understanding of the action of the pupillary action.

The normal diameter of the pupil is 5 mm. When the eye is exposed to excessive brightness the pupil contracts to about 2 mm., and when exposed to very low brightness it expands to approximately 8 mm. Within the usual limits of brightness found in ordinary life the pupillary opening remains normal at about 5 mm. When exposed to a relatively bright surface it momentarily contracts until the retina becomes adapted to this new order of brighness and then opens again to its normal value. The reverse is true when the eye is exposed to relatively low brightness. Thus the pupil is only a protective device for the retina, and it is to be particularly noted that the process of adaptation takes place in the retina and not in the pupil.

It is also interesting in this connection to note that when one works under very low illumination, where the retina is unable to become completely adapted, the pupil remains open abnormally. Fitz* has pointed out that under such conditions greater areas of optical surfaces of the eye are uncovered, which has the effect of intensifying the optical defects of the cornea and lens, thereby incurring the danger of eye strain even in apparently normal eyes. Thus it will be seen that abnormally large pupillary openings operate against, rather than help, clear vision.

DAVIS H. TUCK.
New York, N. Y.

Companies Generating 133-Cycle Current

CONTRARY to general belief, there are not a few companies in the country which are still generating current at odd frequencies. It is surprising to note that there are forty-four of these companies which use 133 cycles. Of these, two are in Maine, one in Massachusetts, four in New York, one in New Jersey, two in New Hampshire, two in Virginia, one in North Carolina and two in Georgia. Florida has one, Ohio seven, Indiana two, Illinois five, Michigan two, Wisconsin one, Minnesota one, Kansas one, Kentucky one, Mississippi three, Texas one, Montana one, Wyoming one, New Mexico one and Oregon one.

*Fitz, G. W., "Practical Methods for Testing Natural Illumination." *Transactions* International Congress of School Hygiene, Buffalo, N. Y., 1913; Vol. II, p. 396.

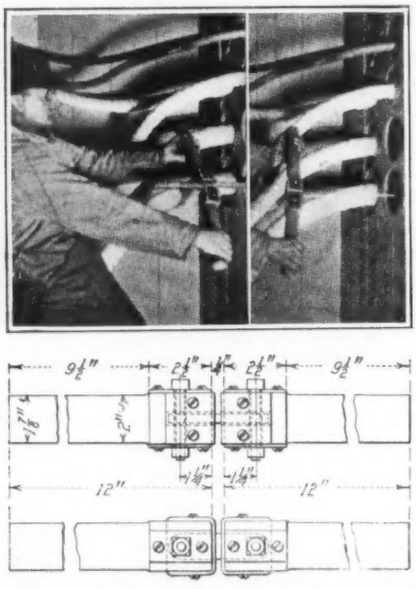
Central Station and Industrial Practice

Installation, Operation, Maintenance, Test and Repair of Generation and Distribution Equipment, and Methods of Economically Utilizing Electric Service in Large Industrial Plants

"Lace-Wire Puller" Hastens Underground Work

By L. A. Bryant
Supervisor Underground Department
Dayton (Ohio) Power & Light Company

To facilitate the drawing of cable through underground ducts, the Dayton Power & Light Company is making good use of a tool called the "lace-wire puller" or "rod pusher." This tool consists of a double toggle with two hickory wooden handles as shown in the accompanying illustrations. It has been



WITH THIS "LACE-WIRE PULLER" UNDERGROUND CABLE PULLING BECOMES LESS DIFFICULT

of great assistance both in "rodding" and in "lacing" ducts, because of its two flexible links, which allow various-sized rods or wires to be pulled. Wooden rods 4 ft. long hinged together are so heavy that they require more pressure to force them through duct lines. With this device direct force applied by the hands is all that is necessary.

When these rods are pushed from one manhole to the next, the "lace-wire puller" (No. 12 galvanized iron) is attached and the rods are pulled back into the manhole, thus lacing the duct with the wire. Following this, the heavy pulling rope necessary to pull the cable is drawn through. For this operation the operators have frequently used their pliers to hold on to the wire, which has sometimes nicked it and caused it to break when subsequently used.

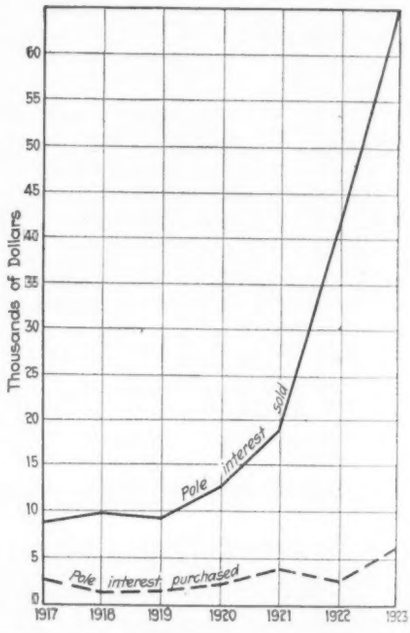
Joint Pole Construction in Southern California

Within the space of a few years joint pole construction has advanced from its early stages of rather doubtful experiment to the point where it has become recognized as a necessary and important factor in the line construction work of many utilities. At its inception the joint use of poles was considered only in exceptional cases or where physical obstructions made two or more poles or lines of poles impossible or impracticable. It has now reached the stage in southern California where a line is never planned or built without taking into consideration the space requirements of other utilities for present or future use.

From an economic standpoint joint use of poles is good business, as both the initial investment and the operating expenses are reduced by one-half, or even more where three or more utilities combine. But of more importance perhaps than this saving is the elimination of unnecessary poles from the streets and highways, with the resulting beneficial psychological effect on the public mind. In many instances public utilities have forestalled the passage of underground ordinances by municipalities — thus saving the heavy investment of placing wires underground—by eliminating all unnecessary poles through a common-user agreement. There are cases also where the practical co-operation of utilities in the joint use of poles has kept cities from taking mandatory action requiring joint use.

As shown in the accompanying chart, the value of pole interests sold by the Southern California Edison Company has risen steadily since the inception of joint ownership in 1917. The total value of such interest sold had reached $64,000 at the end of 1924. As compared to this, the interest purchased in poles of other companies totaled only about $6,000. This is due to the fact that the majority of the line extension work and the placing of poles in new tracts was done by this particular company.

A joint-pole committee, which is composed of a representative of each of the major utilities, administers the joint-pole agreement between



JOINT POLE INTERESTS SOLD AND PURCHASED BY THE SOUTHERN CALIFORNIA EDISON COMPANY

these companies. An office is maintained in Los Angeles with a paid secretary and four clerks. The expense of this office is shared by all parties in proportion to the amount of business transacted during each month. Many of the small telephone companies and other utilities operating in the territory also participate in the joint use of poles and purchase interest through a limited membership in the committee. Those who do not desire joint interest are allowed the use of the poles of the Edison company on a rental basis. During 1923 the rental from attachments amounted to $1,979.

Gasoline Wagon Used in "Shooting" Trouble

BY J. P. DYSART
Superintendent City Lighting and Trouble, Kansas City Power & Light Company

TROUBLE "shooting," even at its best, is accompanied by so many difficulties and hazards to linemen that any methods which will lower these risks and improve service are bound to be of great value to the utility company employing them. Being responsible for the maintenance of the 33,000-volt line running 35 miles to Olathe, Kan., the Kansas City Power & Light Company took advantage of the fact that an interurban railway line runs parallel to the transmission line and purchased a 6-hp. gasoline "speeder" power wagon similar to those in use on steam railroads for maintenance crews. This equipment was purchased in 1922 and has been in effective service ever since. Dirt roads run parallel to the transmission line at only two points, and the "speeder" has been very useful in lowering time in getting to the scene of trouble for use on the railroad tracks.

This machine is kept at the Fortieth and State Streets substation, where a spur track allows it to be run direct to the trolley line. It is large enough to hold three men and all tools needed, but at the same time it is light enough to be carried around stalled cars or to be removed from the track to allow interurban trolley cars to pass. Night trips are provided for by mounting a powerful acetylene lamp on the front of the speeder. While running 15 miles an hour the complete line can be readily inspected within short order.

When a call for trouble on this line goes out the interurban load dispatcher is telephoned and told that the gasoline "speeder" is being sent out to shoot trouble. When the trouble is located and repaired the troublemen must call the load dispatcher again and get orders to proceed back to Kansas City. By this co-operation between the two utilities the track crew are informed that the power company's "speeder" is on the track and know when to keep a lookout for it to prevent accidents. The driver of the "speeder" is warned to telephone the interurban load dispatcher of his movements and telephones are installed at three places to enable him to do this.

Since the "speeder" is generally needed at a time of stress, it is kept constantly in good condition, being inspected once every week and always complete with tools and having the 2-gal. gasoline tank completely filled. The use of this machine has been particularly effective in storm periods, when operation over the dirt roads is almost impossible.

Measuring Cable Stresses with a Dynamometer

FOR measuring the stress to which cables are subjected when they are being pulled into their ducts the Brooklyn Edison Company is utilizing a dynamometer of 50,000 lb. capacity. The pulling stressses encountered necessarily run high in many cases, and as 27,000-volt transmission cable represents quite a heavy investment, it was decided to make a complete survey of all the stresses encountered over the entire system, data being taken on all methods of pulling in cables.

The tile and fiber ducts in which these cables are laid often exceed the diameter of the cable itself by but a fraction of an inch, and the resultant friction to be overcome in pulling is especially great if irregularities or bends are encountered in the duct run. Should the stress be excessive, serious damage is likely to result to the cable through mechanical displacement of the conductors and insulation.

It is probable that displacement due to excessive stress allows the occlusion of air between the layers of paper composing the insulation. Under operating voltage this occluded air would ionize and offer but little electrical resistance. Consequent puncturing of layers nearest a conductor would be followed by successive failure of adjacent layers,

FIG. 1—METHOD OF FEEDING CABLE INTO DUCT

the electrical strain becoming greater and greater with the decrease in number of unperforated thicknesses separating conductor and sheath, until breakdown results. Failure between conductors is assumed to occur in similar manner. While after a normal electrical failure it is customary to resplice and use the remaining section of a cable length again, it has been found advisable to discard such cable as has also been subject to excessive mechanical strain before breakdown in service, indications being that insulation throughout the entire length may have deteriorated.

Another way in which damage occurs is through abrasion or cutting of the lead sheath by too heavy a pull against obstructions in the run, such as sharp edges of poorly aligned duct. Such an opening permits the entrance of water which damages the insulation.

The method of feeding the cable into the duct is shown in Fig. 1, while the device used to determine the maximum stress is shown in Fig. 2. When the cable is almost

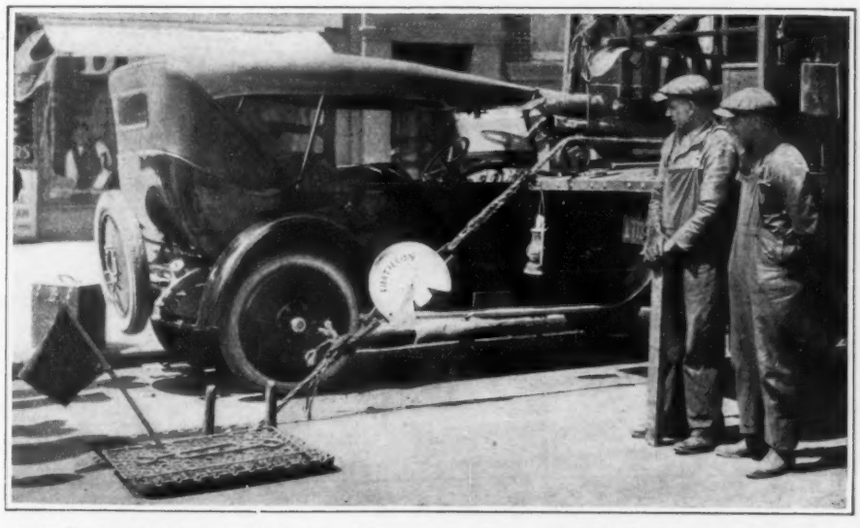


FIG. 2—DYNAMOMETER USED TO DETERMINE FORCE NECESSARY TO PULL CABLES IN

completely drawn through (i.e., when the amount of friction is normally greatest) the dynamometer is inserted between the cable and winch as shown, and measurement is made of the force required to complete the pull, a maximum-reading pointer on the instrument recording the stress after force has been removed. Determinations made on 250-ft. lengths of cable in 3½-in. duct have varied from 3,000 lb. to 23,000 lb.

Overhead Distribution Construction

Standardized Practice as Developed and Used by the
WEST PENN POWER COMPANY, PITTSBURGH

Grounding of Secondary Circuits

General.—Before grounding any circuits as provided below, the circuits shall be tested for accidental grounds. If such are found on three-wire circuits, the services shall be transferred so that all accidental grounds are on the neutral wire. On two-wire circuits the ground shall be made to that side of the circuit found to be accidentally grounded. In grounding two-phase and three-phase circuits the phase containing the accidental grounds can usually be transferred so that it will be the phase to be permanently grounded, but if not, then the accidental grounds shall be removed before proceeding further.

When a secondary circuit is permanently grounded, all meters on the secondary must be checked and the current coil or coils of the meter transferred to the undergrounded side or sides. This is important, and care must be exercised to see that this is done in each case.

What to Ground.—Ground conditions on all new work or replacements shall be made at the following points on the distribution system:

(a) One side of each 115-volt, two-wire secondary circuit (Fig. 58A).

(b) The neutral wire of each 115/230-volt, three-wire, single-phase secondary circuit, and the neutral point of the transformer supplying each 230-volt, two-wire, single-phase, secondary circuit (Fig. 58B).

(c) One side of each 115-volt, three-wire, three-phase secondary circuit where such exist (Fig. 58C).

(d) The secondary middle point (or a conductor or line wire connected to the middle point) of the transformer supplying lighting service in each bank of transformers supplying three-phase, 230-volt power and also supplying lighting service (Fig. 58D).

(e) One secondary-phase wire of each bank of transformers supplying 230-volt, three-phase power only. If the bank is open-delta, the common phase wire shall be grounded (Fig. 58E).

(f) The secondary middle point (or a conductor or line wire connected to the middle point) of the transformer supplying lighting service in each bank of two-phase, 230-volt service, if the phases are connected in customer's equipment (Fig. 58F). In this case the two phase wires which have common potential shall be connected together at the transformers.

(g) The secondary middle points (or conductors or line wires connected to the middle points) of both transformers of each bank supplying two-phase, 230-volt power, whether supplying lighting service or not, if the phases are not connected in customer's equipment or elsewhere (Fig. 58G).

(h) The two secondary-phase wires of common potential in each bank of transformers supplying two-phase, 230-volt service only, if the phases are connected in customer's equipment or elsewhere (Fig. 58H). In this case the two wires referred to shall be connected together and to a common ground.

(j) Some point on each secondary installation of 230 volts or less. If any case occurs which is not covered by the above items, it should be referred to the distribution engineer.

(k) The primary neutral point of each three-phase bank of 6,900-volt transformers on 12,000-volt circuits.

(l) Ground terminal of each lightning arrester.

(m) The cases of transformers which are installed indoors, on ground platforms, or otherwise so arranged that a person may touch the transformer cases while in contact with ground or grounded objects, shall be thoroughly grounded. In ordinary pole-type transformer installations of 2,300 volts or 4,000 volts the cases shall not be grounded, but the cases of all transformers, 6,900 volts and higher, shall be grounded.

(n) One side of the secondary of each potential or current transformer used on circuits over 1,000 volts shall be grounded in the manner shown in Fig. 9. In polyphase installations the common secondaries of the current and potential transformers are the wires to which the ground connections shall be made.

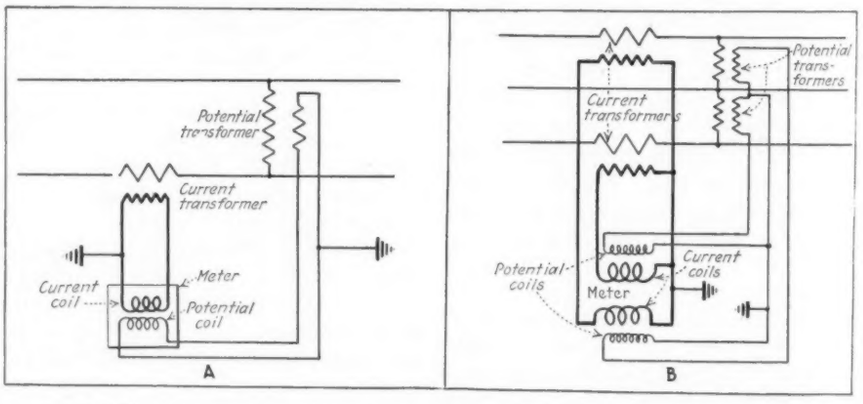


FIG. 59—ONE SIDE OF SECONDARY OF EACH INSTRUMENT TRANSFORMER SHOULD BE GROUNDED

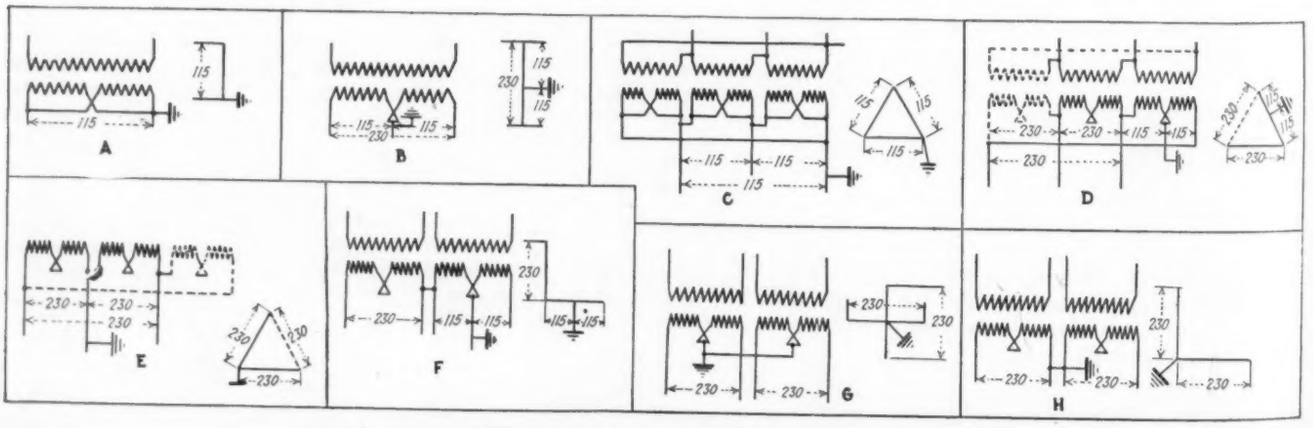


FIG. 58—POINTS ON DISTRIBUTION SYSTEM THAT SHOULD BE GROUNDED

Variable Load Chart for System Dispatching

BY J. V. WALL
Stone & Webster, Inc., Boston, Mass.

TO SHOW all loads on a transmission system for five distinct load periods the chart shown in the accompanying illustration was devised. By means of this diagram showing operating conditions and loads the operating official is able to determine just which line can be carried by a certain transformer bank while extensive construction work is being carried on at various points on the system. It has also proved invaluable in emergencies on either lines or transformers since it saves log-sheet reference, slide-rule calculations, etc., all of which increase the length of service interruptions.

In making this chart a single-line diagram of the main transmission system is drawn on a piece of white manila pressboard of proper size to mount conveniently in a wooden frame, which can be hung on a wall or mounted on the desk used by the operating official. The chart shown measures 16 in. x 20 in. Slots are cut in the pressboard of sufficient size to uncover legible figures representing the kilovolt-ampere loads on each line. For five figures maximum it was found that slots $\frac{5}{16}$ in. x $\frac{3}{8}$ in. wide gave a sufficient margin to eliminate shadows around the figures so that they could be easily read through the slots. The loads for any desired number of periods are lettered on a second piece of pressboard on which the first piece carrying the single-line diagram is mounted so that it will slide. This was done by gluing to the second piece of pressboard two guide strips about $\frac{1}{2}$ in. wide and then tacking on two other wider strips to hold the movable diagram in place.

The condition of all transformer and line oil switches as well as important line section switches is indicated by small black tacks cut off to a convenient length for plugging into $\frac{1}{8}$-in. square pieces of heavy pressboard which are glued to the face of the movable diagram. For moving the outer pressboard a small handle is mounted near the bottom.

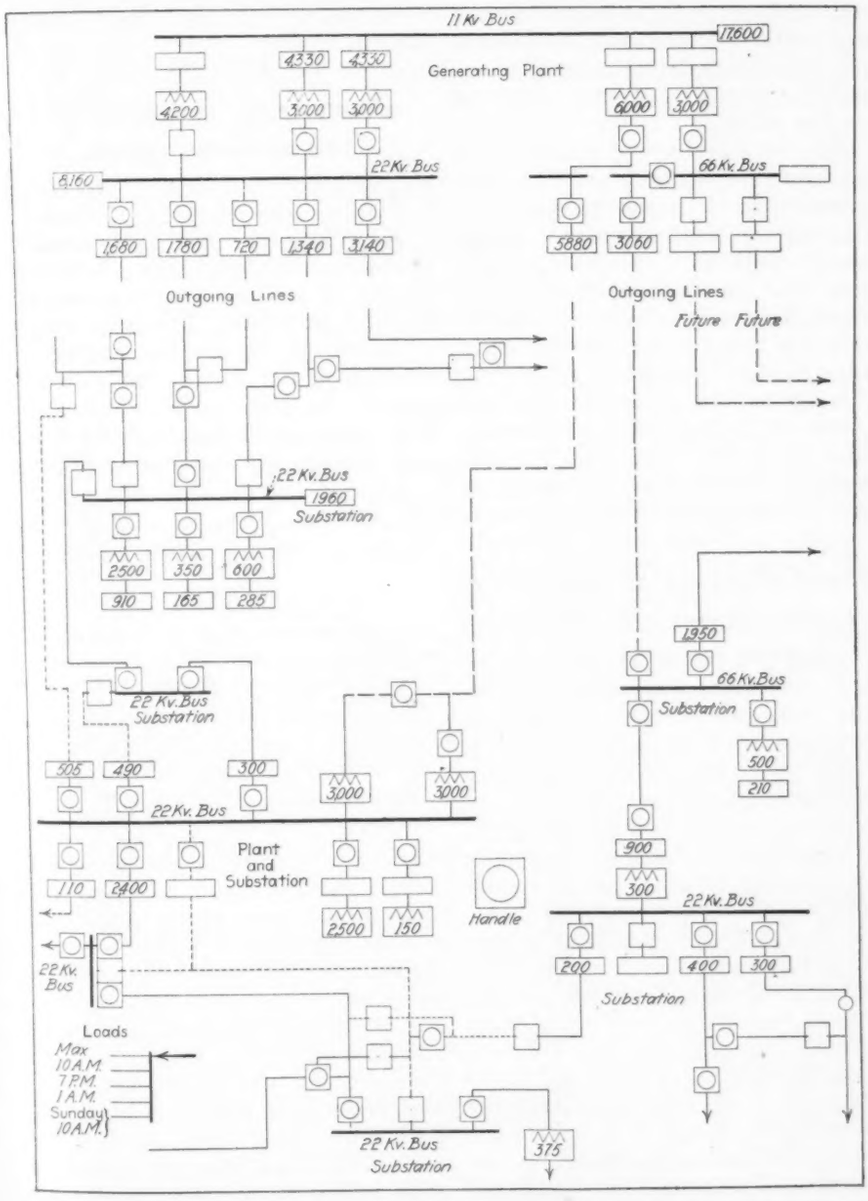
At the lower left-hand corner of the diagram an arrow points to five figures which are drawn across the guide strips to the figures representing the load periods for which the chart is designed.

In actual use, when the operator moves the chart so that the arrow line points to any one index—for instance, 1 a.m.—the figures read through the slots on each line show approximately what the load is on the entire system at this time.

For normal operation the line and station switches are plugged in (for the closed position of switch) to correspond with the position of switches on a much larger dispatching board showing complete details of lines, high-tension equipment, wire sizes, high-tension substations, etc.

When any portion of the system is under construction or repair, the most suitable period during which any specific number of lines can be carried on any one bank of transformers is readily found by sliding the chart to either of two light-load periods. The length of time which can be taken to perform this construction or repair work is quickly determined by the typical daily load curves which are included in the left-hand margin of the chart.

In case of emergencies, such as the loss of any large-capacity transformer bank, it is immediately evident to the system operator that the remaining transformers can be operated safely if certain lines are dropped. The possibility of the power-house or substation operator making mistakes in reporting load conditions to the system operator is eliminated, since the figures appearing on the load chart are carefully compiled from average conditions for each of the chosen load periods on each line or transformer bank.



MOVABLE CHART AIDS IN DETERMINING LOAD DISTRIBUTION IN EMERGENCIES

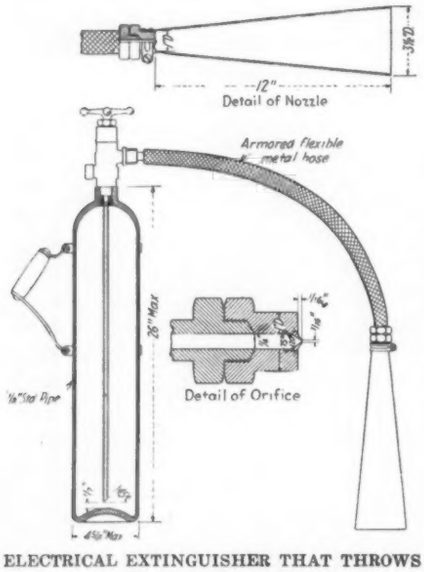
All loads are given in kva. For amperes on 66-kv. circuits divide by 120, on 22-kv. by 40, on 11-kv. by 20 and on 2.2 kv. by 4.

Fire Extinguisher Using Dry CO_2 Gas

BY C. L. JONES
Industrial Fellow Mellon Institute of Industrial Research, Pittsburgh, Pa.

INERT gases have long been regarded as an ideal means of extinguishing electrical fires as they cause no electrical or mechanical damage. Unlike soda-and-acid or foam extinguishers, inert gas is non-conducing, non-corrosive and makes no mess. Carbon dioxide, probably the best of these inert gases, is non-poisonous and does not dissolve insulating material as does carbon tetrachloride to a certain extent.

The Bell Telephone Company of Pennsylvania has been a pioneer in the use of this kind of extinguisher as it has used dry CO_2 gas extinguishers for some years. However, on account of limited effectiveness against fire, lack of dependability of discharge and the tendency of the valve used to freeze up, this type of extinguisher was never adopted generally, and, in fact, the Bell Telephone Company of Pennsylvania had considered its discontinuance. The extinguisher illustrated here is an improvement over the older type and eliminates the difficulties formerly experienced. It is the result of co-operative work carried on by the engineers of the Bell Telephone Company of Pennsylvania and the carbon-dioxide manufacturers' research chemist at the Mellon Institute of Industrial Research, Pittsburgh, and embodies the following new features fundamental to its successful functioning:



ELECTRICAL EXTINGUISHER THAT THROWS COLD INERT GAS AND CO_2 SNOW

1. The freezing up formerly experienced was due to the vaporization of liquefied carbon dioxide in the cylinder. This cooling effect is now made available for "freezing" the fire by placing in the cylinder a siphon tube which delivers the carbon dioxide as a liquid through a flexible metal hose to a specially shaped orifice, which must be of the type illustrated. This results in discharging in suspension fine dry carbon dioxide snow in gaseous carbon dioxide, all at approximately — 100 deg. F. This mixture is discharged at a uniform rate for about forty-five seconds, when the liquid is exhausted. For two minutes additional cold, dry gas is discharged without the snow in suspension.

2. The velocity of the gas stream is so great that it entrains a great deal of air with it if means are not provided to prevent this. In the type illustrated this requirement has been met by providing a fiber nozzle of conical shape.

The extinguisher has had a trial on telephone switchboards and has proved very successful in extinguishing fires which can be approached within 7 ft. This includes most fires in switchboard equipment after the equipment is dead electrically and many in live wiring. Like all other fire extinction appliances, this device has its special field and cannot be applied indiscriminately to all kinds of fires. However, it gives promise of solving vexatious problems in extinguishing electrical fires.

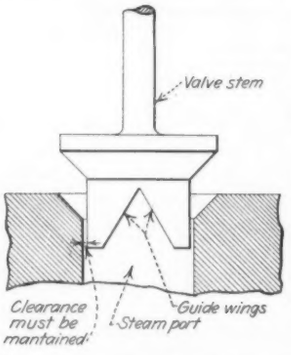
Hand Slotting of Auxiliary Commutators Preferred

DESPITE the advantages claimed for mechanical means of slotting commutators, C. B. Kelley, maintenance foreman Kansas City Power & Light Company, still favors the hand method. This primary reason is that this type of slotting eliminates the burning of the copper commutators which is common when machine slotters are employed. Since continuity of service is of prime importance, the failure of any one unit owing to flaws in commutation cutting is very serious. Conditions in central stations are far different from those encountered in industrial plants, because should an auxiliary go wrong in the central station the service of the entire plant is endangered, while in the industrial shop the delay, however inconvenient, is not necessarily disastrous.

By the use of a sharp hand tool built of a hack-saw blade, to which a handle has been added, the maintenance department of the Kansas City Power & Light Company is able to produce better results than with a machine. This blade is made very sharp and does not harden the copper as would be the case if a dull tool were employed. The sharp tool also prevents splinters of mica from extending beyond the commutator up into the brush area as they may do with a machine-cut job. Although the relative cost of the hand method is about three times that for the machine method, cost is not the real criterion, but reliability of service. It has been found that on most auxiliaries a clean-cut hand job once in every six months is sufficient where machine-cutting jobs had formerly required a refacing every three months.

Preventing Hunting of Turbo-Generators

ONE utility company in Tennessee, the Memphis Power & Light Company, has had trouble from hunting of turbo-generators due to the governor valves becoming sluggish in action. The cause never appeared to be in the governor mechanism but rather due to binding of the valve guide wings. As near as an investigation could indicate this trouble was due to "growing" or warping of the valve guide wings, causing them to grasp the walls of the steam ports. While the trouble might be corrected by redesign of the guide wings, the company has adopted the expedient of testing the valves every month, when the machines are shut down for a short time anyway. If insufficient clearance is detected, the guide wings are filed down. The operation does not take much time, and the frequency with which it has been performed has been found sufficient to prevent recurrence of hunting.



WHEN GUIDE WING CLEARANCE IS INADEQUATE TO ALLOW FREE VALVE ACTION THE WINGS ARE FILED DOWN

Central Station Business

Advertising, Selling and Service Methods
Commercial Organization and Management, Customer and Trade Relations, Public and Financial Policies, and Reports of Company Plans and Experiences

Device for Demonstrating Kitchen-Lighting Units

WHEN the Southern Public Utilities Company sold 10,203 daylight kitchen units in a six weeks' campaign one of the problems that had to be worked out was a practical method whereby salesmen and demonstrators could show the prospective purchaser how the light

DEMONSTRATION OUTFIT FOR KITCHEN LIGHTING UNIT

would look in her kitchen. To attempt to demonstrate the unit by standing on a chair and trying to hold it up to the ceiling was awkward, and the salesman was unable properly to present his selling argument.

Accordingly the device shown in the accompanying illustration was made up. It can be easily assembled in almost any shop from the following materials: One kitchen unit complete, one small pin-plug connector, 6-in. flat twin cord, 8 ft. No. 16 flexible cord, one attachment plug (cap and base), one 1-in. wooden stick of suitable length, two stove bolts, $\frac{1}{8}$ in. x $\frac{3}{4}$ in., and 14-in. 1-in. steel tube.

The steel tube is flattened in a vise as shown and two holes are drilled. It is then formed with a right-angle bend, and this section is bolted to the hanger strap, making a convenient handle for carrying the lighting unit. The light wooden stick is detachable, as is the extension cord, making them both easy to carry. This outfit makes it possible for the salesman to place the unit lighted in the exact position in which it will be permanently installed and thereby demonstrate the actual results to be obtained.

Visualizing the Decreased Cost of Energy

TO SHOW the public how the cost of energy has decreased during the last sixteen years the Montreal Light, Heat & Power Consolidated is using the comparison shown in the illustration below in its newspaper advertisements and on the back of bills. At a recent meeting of the company's board of directors it was decided to reduce the net rate for electric lighting service from 4¼ to 4 cents per kilowatt-hour by increasing the discount for the company's standard 5-cent rate from 15 per cent to 20 per cent.

When this reduction was made public the local press, both in news articles and editorials, referred to the company's action in a most flattering manner, emphasizing that this and all the previous reductions had been made by the company voluntarily and without being expected or requested by the public. In announcing this reduction the company made the following comments:

While the cost of every item of industrial production and necessaries in domestic life in Montreal, as elsewhere, was very greatly increasing, especially in the past ten years, our company was steadily decreasing the price of its service, reducing the electric lighting rate since 1908 by almost 69 per cent. Few communities of the world are afforded such cheap electrical service for illumination or the use of domestic labor-saving appliances as those served by our company.

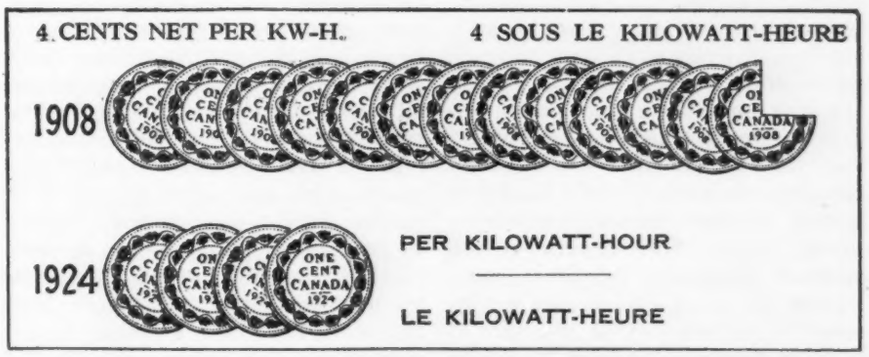
Besides, our net rate is what it is stated to be. The users of our service are not subjected by the federal, provincial or municipal governments to increased taxes because they are furnished with low-priced electrical energy. Our company contributes its full share of taxes, those for the last year amounting to over one million dollars.

The present rate means that the users of our service can for 4 cents operate a washing machine for over three hours, an electric iron for two hours, a vacuum cleaner twenty minutes every day during two weeks, a toaster fifteen minutes every day for a week and an electric percolator fifteen minutes every day for nine days, or have seven 25-watt lamps burning for five consecutive hours.

There is no doubt that this cheap electrical energy will tend to popularize better illumination and wider use of electrically operated household appliances, provided that their advantages are constantly and properly brought to the attention of the public, work which every one of us connected with the company should bear in mind at all times.

Electric Heating Cuts Cost 50 per Cent

THE versatility of industrial electric heating is well illustrated in a recent installation of three electric japanning ovens with automatic temperature control for baking enamel on shoe eyelets made by the Atlas Tack Corporation, Fairhaven, Mass. These ovens supplant seven steam-heated ovens and do the same work. Furthermore, the use of the electric oven has decreased the cost



A GRAPHIC PRESENTATION OF REDUCED COST OF ELECTRIC ENERGY

of the japanning about 50 per cent by speeding up the operation and improving the products so that there has been considerably less rejected material.

In the process of manufacture the eyelets are punched out of brass sheeting, dipped in japan and then pressed on cardboard sheets. They are then painted and sprayed with four to six coats of enamel, which is baked on in the electric oven for a period of two hours after each coat. One of the most important features of the electrical process is the ability to get a free circulation of air through the heaters while they are in operation. This is accomplished by a 3-hp. motor operating a blower for forced ventilation, one of which is installed on each oven. Air is forced into the bottom and sucked out at the top, thus drying the enamel rapidly and uniformly.

The electrical process, according to William J. Fitzsimmons, plant engineer of the Atlas company, gives a clean, even heat that is easily controlled and results in a superior finish in a shorter time, thus increasing the capacity of the department devoted to this process.

Each one of the ovens contains six General Electric heating units of 6 kw. each. The ovens are operated at temperatures ranging from 270 deg. to 350 deg. F., and the operating temperature is held within less than 1 per cent variation by means of a Leeds & Northrup temperature-controlling instrument. The average operating temperature is 285 deg. F. The total connected load is 114.75 kw., and each oven has a maximum demand of 32.3 kw. The total monthly consumption during a full month's operation was 17,700 kw.-hr., the average daily consumption being 737.5 kw.-hr. during a period of twenty-four working days.

Central-Station Power Versus the Private Plant

Disadvantages of the Isolated Plant Which Are Sometimes Overlooked in Comparing the Relative Merits of the Two Sources of Power

BY H. C. THUERK
Commercial Engineer Erie (Pa.) Lighting Company

ANY discussion of the advisability of installing a small private electric power plant or of purchasing electric power from a central-station company should include careful consideration of a number of conditions and facts in addition to the ordinary comparison of costs. Too often these factors are lost sight of when the consideration of the power problem is confined merely to a comparatively few cost items.

It is usually difficult for a manufacturing establishment to forecast its probable growth over a period of ten or fifteen years. Equipment which is installed may seem adequate and sufficient for many years to come, but the experience of a number of large industrial and manufacturing concerns has shown that future expansion was greatly underestimated. For this reason it often becomes necessary to install larger machines having greater capacity within a comparatively short time after the original installation has been made. Instead of being able to use equipment for a long period of years it is often necessary to limit its use to four or five years. In many cases the location of the private power plant must be changed, a procedure involving considerable expense. Conditions such as these result in high fixed charges on the original installation, which, of course, brings the cost of producing power up to a prohibitive figure.

Apparatus which may be installed today and which in many cases represents the most efficient obtainable may in a few years become entirely obsolete because of improved design and accompanying lower operating costs. It is true that where a large quantity of exhaust steam is utilized the efficiency of the equipment is in many cases not of very great importance. However, in certain cases where the difference in cost, taking all factors into consideration, is very small it may mean a good deal. Except in rare instances, generating equipments for small plants have seldom been used for their entire useful life, as either new and more efficient machines have rendered them obsolete or else their load capacities have been exceeded by increased power requirements. In determining the number of years over which the original cost of such an installation should be charged, this matter of obsolescence should receive serious consideration. Although the machine may be guaranteed to continue in operation for fifteen years, obsolescence has many times shortened the life of equipment five to ten years.

On the contrary, by purchasing electric power additional manufacturing processes and increases in the output of an establishment may be accomplished with a very low investment, and none of the already installed equipment need be discarded because of inadequacy or obsolescence. Central-station power service provides the greatest flexibility possible for both expansion and curtailment of output with a minimum expense. This is a very important point to be considered and in a number of instances has been the factor which has brought about the decision to use central-station service.

It is impossible to compare the cost of producing power in a private electric plant where only one generating unit is installed with the cost of electric power furnished by a central station. With only one unit installed no reserve capacity is available, and in case of trouble to either the generator, prime mover or auxiliary apparatus the entire factory must necessarily cease operation until the unit is repaired or until relief is obtained from other sources. In any case shutdowns involving considerable loss of time must be expected when a single unit is depended upon for power. Incidentally, repairs to equipment of this kind often run into hundreds of dollars and may amount to thousands of dollars, depending, of course, on the nature of the trouble and length of shut-down.

ADVANTAGE OF RESERVE CAPACITY

On the contrary, central stations have a number of additional generating units in reserve at all times and which can be started up at a moment's notice in case of trouble in any one generator. The present tendency of interconnecting large electric power systems with one another provides additional reserve capacity at all points on such systems. This means that the possibility of service interruptions due to power-station trouble has been reduced to such an extent that it can safely be said that they are next to impossible. The present practice of constructing loop circuits for the distribution of electric power has continually re-

duced the possibility of interruptions caused by line trouble.

These factors alone enable the central station to render much more dependable and reliable service than is possible with a private plant, and any comparison of costs must of necessity take into consideration the installation of at least two generating units in the private plant. This matter of reserve equipment is one which has also made central-station service preferable to a great many industrial managers and executives.

INCREASING COST OF BUILDING PLANTS

During the past ten years all of the items which enter into the construction and operation of electric generating stations have constantly increased in cost. Mechanical and electrical equipment has increased approximately 75 per cent to 100 per cent, building costs 100 per cent, wages 100 per cent, the cost of coal delivered has greatly increased, and the general cost of living has increased about 60 per cent. In spite of all of these increases, the cost of electric power distributed by central stations has in general all over the country decreased about 5 per cent. This downward trend of the cost of purchased power has been brought about by the consolidation of small companies, the use of large generating units of high efficiency, the combined operation of steam and hydro-electric plants and the construction of high-voltage transmission lines, over which cheap power is brought to cities and industries situated a considerable distance from the coal mines and water-power sites. None of these economies can be effected by an isolated, privately owned and operated power plant. The results of the interconnection of these large water-power and steam stations are bound to be reflected in the rates which are charged for electric power.

In the installation of a private electric plant the owner must of necessity face the fact that the general trend of operating costs of small private plants has been upward, whereas the general trend of the power rates of central stations has been downard. Leading authorities declare that there is every reason to believe that this tendency will continue during the coming years. This trend of costs has brought about a condition such that in plants where a considerable amount of exhaust steam is used, it is frequently much cheaper to purchase what power is needed and equip the plant with the minimum boiler capacity to meet the requirements for process steam.

The question of coal supply should be seriously considered in comparing the relative merits of purchased or private-plant power. Strikes of more or less importance have occurred each year, and in many cases resulted in a serious scarcity of coal and accompanying high prices. In a number of instances severe car shortages have occurred at the same time. which has helped to magnify the fuel scarcity due to the closing of the mines. In addition to the scarcity of coal and car shortages, the quality of the coal obtainable during such periods is often very poor, and as a result maintenance and depreciation on boiler equipment is increased considerably. A manufacturer who depends upon his own private generating plant for electric power is subject to fluctuations in the price and quality of fuel brought about by the conditions just referred to. Scarcity of fuel may often be serious enough to cause a curtailment of output of a manufacturing plant

LACK OF SUPERVISION

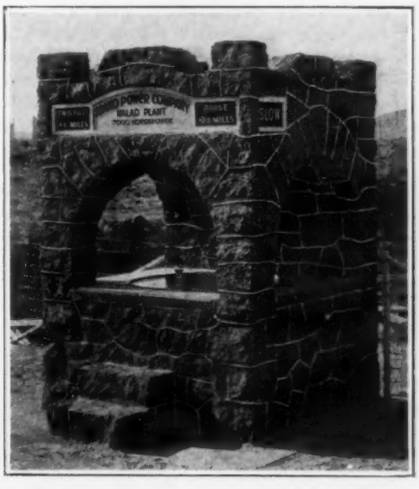
Another important point which is often disregarded is the matter of supervision and responsibility for power production. No matter how small the plant may be or how competent the operating engineers are, a considerable amount of thought, time and effort must be given to the power problem by the executive directing the affairs of the concern. To the man who is engaged in directing the operation of a large industry power production is often very much neglected because of the ever-increasing demands and responsibilities which the business itself calls for. This condition results in lower efficiency of operation in the power plant, with the result that production in the factory is affected. Many executives have found that their own business has gained financially when they have been able to devote the time spent in the consideration of power-plant matters to the development and improvement of processes and methods in the business itself.

No manufacturing concern is justified in making an investment in a private generating plant unless that plant can show the same percentage of profit on the investment that would accrue if the same amount of money were invested in some part of the manufacturing plant which warrants expansion. In most cases it will be found that the same amount of money invested in a private generating plant will show a higher rate of return if expended in other improvements.

All of these considerations vary and must be evaluated for each individual case, but there can be no doubt that each has a very real value in dollars and cents. It is because of a certain difficulty in assigning definite values that these items are sometimes omitted or partly overlooked in discussions of the relative costs of central-station service and private power-plant generation. This difficulty of evaluation should not, in justice to a fair consideration of the power problem, keep these considerations in the background, for oftentimes they may be of sufficient value to warrant the use of central-station power even if the bare kilowatt-hour is slightly greater than the over-all cost of private power-plant generation.

Drinking Fountain Advertises Hydro-Electric Power

THE appearance of the property at the Malad plant of the Idaho Power Company, adjoining the state highway, has been improved by the erection of a public drinking fountain, as shown in the accompanying illustration. Two bubbling streams supply spring water to the thirsty traveler. Road direction signs as well as information about the company's hydro plant have been placed on the fountain and are illuminated so as to be serviceable at night as well as by day. The fountain makes a popular stopping place for the tourist and has occasioned much favorable comment.



DRINKING FOUNTAIN ON PUBLIC HIGHWAY INSTALLED BY IDAHO POWER COMPANY

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from All Parts of the World

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Hydro-Electric Development and Steam Equipment

Modern High-Power Pelton Wheels.—R. HOFFMAN.—In the Swiss railway power station at Amsteg have been installed five waterwheel generating sets with a combined output of 71,500 hp., representing the most modern and probably the largest Pelton-type turbines in Europe. The article deals only with the description of these turbines and their regulating devices. A net hydraulic head of 900 ft. is available, which impinges through two water jets of 8¼-in. diameter each upon the two runners of the twin Pelton wheel with a diameter of 70 in. With twenty cast-steel buckets on each wheel a speed of 333⅓ r.p.m. is obtained, consuming 4,750 l. of water per second and delivering 14,300 hp. per turbine. Having to withstand 333 impulses of 17½ tons per minute and at the same time a centrifugal force of 102 tons, the buckets had to be fastened to the wheel disks in an unusually solid and reliable manner. A combination needle nozzle and jet-diverting arrangement has been provided, the latter able to turn the jet off the wheel in case of lost load within one second. Six sectional drawings, one photograph and two speed regulation diagrams illustrate the paper.—*Zeitschrift des Vereines Deutscher Ingenieure*, April 19, 1924.

Generation, Control, Switching and Protection

Improving Flexibility and Cost of Power.—By tying in its own power stations with the distribution lines of the local electric light and power company the John A. Roebling's Sons Company has found it possible to obtain exceptional ease of control and freedom from interruption in its wire plants. Recently a 10,000-kva. substation has been built for this company, the details of the construction being given in the article.—*Iron Age*, April 17, 1924.

Reactance as a Means of Protection.—C. C. GARRARD.—Even with the maximum possible generator short-circuit reactance, additional external reactance is required in large power stations to prevent an excessive flow of current. The most economical and convenient method of installing such reactance coils is to connect them so as to subdivide the busbar. With these reactance coils at various positions in the busbar the problem of calculating the maximum flow of current at any one point must be considered. A mathematical treatment of this problem is given.—*Electrician* (*England*), April 18, 1924.

Overdamped Condenser Oscillations.—C. P. STEINMETZ (deceased).—The equations of the condenser discharge through an inductive circuit show that these discharges are oscillatory if the resistance of the discharge circuits is less than a certain critical value, $2\sqrt{L/3}$. In this case the damping of the wave is geometric, that is, the quotient of two successive half waves is constant. The discharge is impulsive, if the resistance of the discharge circuit is greater than the critical value.—*Journal of A. I. E. E.*, May, 1924.

Transmission, Substations and Distribution

Automatic Motor-Generator Station.—P. STERR.—The author describes a fully automatic substation containing several large motor-generator sets which has been in successful operation for the last thirteen years. The sets are started from the direct-current side, are brought up to proper speed and voltage and are synchronized to the buses. The motors are 240-volt direct current, the generators giving 3,000-volt single-phase current. Closing of a small remote switch starts the automatic sequence of all the necessary operations for each set. The starting and regulating relays are actuated in proper sequence by means of specially designed pendulum switches of the self-interrupter type and three multipolar master contactors. The synchronizing is accomplished with a combination of contact voltmeter and automatic time relays. Some difficulties were encountered from the injurious effects of humidity upon the relays, but they were overcome by proper ventilation of the station. If any one of the sets is disconnected, its relays and contactors drop back to their original position, so as to be ready for a new start. Simplified diagrams showing wired connections have been a great help to locate quickly any fault in the unavoidably complex wiring of this station.—*Elektrotechnische Zeitschrift*, April 17, 1924.

Units, Measurements and Instruments

Revision of Code for Electricity Meters.—Revision of this code, approved as an American standard by the American Engineering Standards Committee in 1922, is being made by a sectional committee under the joint sponsorship of the Bureau of Standards, the Association of Edison Illuminating Companies and the N. E. L. A., in accordance with the procedure of the A. E. S. C. Four sub-committees have been formed to prepare the draft of the revision under the general direction of sectional chairmen.—*Technical News Bulletin No. 84 of the Bureau of Standards.*

Moving-Coil Measuring Instruments.—S. HELD.—A novel series of instruments are theoretically explained and shown in sketches. These instruments are based on the principle of either having one moving coil within a tri-polar magnetic field or two angularly displaced moving coils in a bipolar field. In this way it is possible to design ohmmeters, phase meters and frequency meters that are very sensitive and accurate. Examples as built by a French concern are shown for each of these three instruments. Of particular interest is the frequency meter, which has sufficient torque to operate a direct ink-writing recording pen.—*Revue Générale de l'Electricité*, April 5, 1924.

Heat Compensation for Hot-Wire Instruments.—A. STEINERT.—To provide what is asserted to be a precision heat compensation for hot-wire voltmeters and ammeters, one end of a platinum-silver hot wire is fastened directly to a brass base of the instrument, while its other end is held on the free end of a strip of a bi-metallic metal. By proper choice of this thermostatic strip and a careful adjustment between it and the initial tension in the hot wire a very accurate heat compensation may be obtained within plus or minus 10 deg. C. variations of room temperature. To avoid heat transmission from the hot wire to the thermostat, the connection between the two is made over a heat-radiating metal disk.—*Elektrotechnische Zeitschrift*, April 17, 1924.

Measurement of Decomposition Potentials.—A. L. FERGUSON and G. VAN ZYL.—In this investigation an apparatus is developed by which a direct comparison is made between all the values obtained by the commutator and direct methods for measuring decomposition potential and overvoltages. Evidence is given which should help materially to settle the controversy that has so long existed concerning the relative merits of these two methods. All measurements made by the commutator method are averages and depend to a large extent upon the operation and mechanical construction.—*Paper presented before the American Electrochemical Society, Philadelphia*, April 24-26, 1924.

Motors and Control

Three-High Plate Mill.—Recently a three-high plate mill was installed at the Clydebridge works of David Colville & Sons, Ltd., in England for the making of ship and boiler plates. The mill is driven by a 13,000-hp., 25/120-r.p.m. direct-current motor, using the Ilgner control system. The plant has been designed to deal with 3,000 tons of plate per week, and it has been found possible to roll at the rate of 46 tons per hour, the plates averaging ½ in. in thickness from slabs 2.7 tons in weight, the maximum number of slabs dealt with being sixty-eight in a period of four hours.—*English Electric Journal*, April, 1924.

Choice of Current for Cranes.—H. GETTERT.—The main purpose of this article is an endeavor to show which kind of current system and motor type requires the smallest amount of electrical energy for the operation of traveling or harbor cranes. The author makes a comparison between a direct-current, three-phase induction motor and three-phase Deri-motor drive for these cranes. The Deri motor is a commutator type of three-phase motor,

with characteristics similar to a direct-current series motor. A practical example of a harbor crane for 4-ton capacity and a lift of 75 ft. for an hourly loading output of 160 tons has been used as a basis for a very elaborate investigation of all factors involved for the three different drives, with the result that the following amount of energy is required:

	Kw.-Seconds
Three-phase induction motor drive	2244
Direct-current drive	1838
Direct-current drive (three-phase current transformation)	2165
Three-phase Deri motor drive	1917

Where direct current is available it should always be used. However, the claim is made that it is not justifiable to convert three-phase into direct current for crane operation, as the commutator type motor is suitable for three-phase crane drive.—*Elektrotechnische Zeitschrift*, April 17, 1924.

Electrification of Oil Wells.—F. TRAPPL.—This paper is written particularly for conditions prevailing in the oil fields of Poland, where practically all of the wells have steam-driven drills and hoists and operate, owing to very crude conditions, in a highly uneconomical manner. The poor mechanical efficiency of the drives is further complicated by the great depth of the oil levels, which vary between 3,600 ft. and 5,400 ft., so that the actual load lifted is only 10 per cent to 20 per cent of the dead load at the start of the lift. Electric drive is being gradually introduced, supplied from a 6,000-kva. steam-turbine power station and a 3,000-volt, three-phase system. For the various drives, 3,000-volt, three-phase induction motors, with wound armature and circulating-water starters, are standardized, which are all designed to stand very heavy overloads. Some of the wells use the rotary system and require very rugged starting apparatus to withstand as many as 8,000 switching operations in twenty-four hours.—*Elektrotechnik und Maschinenbau*, April 20, 1924.

Illumination

Better Illumination Without More Lamps.—W. WENDELKEN.—To obtain proper lighting no one thing will aid more than a coating of white paint spread over the inside surfaces of the shop or building. With a correctly designed lighting system and liberal use of white paint, applied periodically to all surrounding surfaces, the total wattage of a system may be reduced as much as 25 per cent, depending upon the intensity of the illumination required. Even in old installations where the walls are exceptionally dirty and the lighting equipment is insufficient, immediate gains from 10 per cent to 25 per cent are obtainable by this means.—*Industrial Engineer*, May, 1924.

Growth of Plants Under Artificial Light.—Two papers given at the annual convention of the society, the first, "Carbohydrate Production and Growth in Plants Under Artificial Light," by R. B. Harvey, and the second, "Preliminary Studies in the Response of Plants to Artificial Light," by Hugh Findlay. In the first paper the correlation between the intensity of continuous illumination and the quality and feature of the carbohydrates produced in photosynthesis is discussed. In the second paper several experiments are described in which several thousand vegetable seedlings and flowering plants were placed under artificial light and closely studied. The results showed that the plants under the artificial light bloomed about eight days earlier than similar plants placed in sunlight.—*Transactions of the I. E. S.*, April, 1924.

Electrophysics, Electrochemistry and Batteries

Electrodeposition of Copper.—H. Y. EAGLE.—The new electrolytic tank house of the Union Minière du Haut-Katanga (New York, N. Y.) and its operation is described. Of special interest is the design of the electrolytic tanks, which are the largest of the kind ever built. The composition of the electrolyte remains uniform throughout the 50-ft. tank and is characterized by its high acidity and consequent high conductivity.—*Paper presented before the American Electrochemical Society, Philadelphia*, April 24-26, 1924.

Galvanic Coating with Chromium.—Not until very recently was a practical and dependable method found to coat metallic objects with a protective layer of pure chromium in a way very similar to and not much more expensive than galvanic nickel-plating. With slight variations the chromium can be deposited in either lustrous or dull finish. The layer of chromium is exceedingly hard, approaching the hardness of corundum and cut glass. Not being chemically affected by water, most acids or alkalines, and having a very high melting point, chromium coating opens up large and promising possibilities. Its high heat resistivity makes it advantageous for electric heating appliances, spark plugs, gas-motor parts, searchlights, etc. Its hardness makes it useful for typewriter parts, printing type, clockwork, gears, springs, phonograph-record molds, etc. Its non-corrosive character recommends it for surgical and dental instruments, knives, tableware, telephone parts and all articles for export over sea. A plating time of from ten to twenty minutes at high current density is required.—*Elektrotechnische Zeitschrift*, April 10, 1924.

Theoretical and Experimental Study of the Electric Field in an Electrolytic Cell.—A. A. AHMED.—A general expression for the electrolytic conductance is derived in terms of the stream flux and the potential difference between the electrodes and is applied to special problems of complex transformations. The distribution of the electric stress along the surface of parallel plane electrodes is also determined mathematically. The experimental work has been planned with two objects in view—first, to verify the theoretical results by means of experiments in which the mathematical conditions are represented with sufficient and reasonable accuracy, and, second, to apply the theoretical results for the solution of practical questions and to investigate experimentally how far such applications agree with test results.—*Journal of the Institution of Electrical Engineers (England)*, April, 1924.

Traction

Railway and Power Substations Combined for Economical Operation.—The Cicero substation of the Chicago Rapid Transit Company and the Public Service Company of Northern Illinois presents an example of co-ordinated efforts to reduce maintenance and operating costs. This substation houses the apparatus of the power company and a 1,500-kw. railway rotary converter with its switchboard and miscellaneous apparatus. By allocating the fixed and operating charges between the two companies on the basis of installed capacity it was possible for the railway company to obtain a lower conversion rate than would have been possible if a separate building had been built. Details of installation, switchboard arrangement and the special interlocks for protection are discussed.—*Electric Railway Journal*, May 10, 1924.

Telegraphy, Telephony, Radio and Batteries

Incoming Impulses and Their Effect on Wireless Receivers.—E. B. MOULLIN.—The paper contains a mathematical analysis of the effect of an incoming impulse upon a wireless receiver. The effect of each of several wave forms is calculated and the results are compared. The effect is calculated of an impulse acting respectively on a tunnel antenna, on an aperiodic antenna and on a tuned loop aërial, and also on the combination of these with a selective amplifier. In each case a formula is derived which gives the ratio of signal to the impulse, and it is shown that for a given wave length these formulas are identical.—*Journal of the Institution of Electrical Engineers (England)*, April, 1924.

Radio Instruments and Measurements.—This circular of 345 pages presents information regarding the more important instruments and measurements actually used in radio work. Many of the matters dealt with are or have been under investigation in the laboratories of the Bureau of Standards and are not treated in previously existing publications. No attempt is made to deal with the operation of apparatus in sending and receiving. This is the second edition of the circular, a number of corrections and revisions having been made and the bibliography of radio publications considerably extended. The first part of the circular gives a brief treatment of the principles of radio-frequency currents, upon which all measurements are based. Information on standards and methods of measurements is grouped under wave meters, condensers, inductance, coils, current measurement and resistance measurement. Special attention is given to electron tubes, which are extensively used in radio measurements as generators of current, as detectors and in other ways.—*Circular No. 74 of the Bureau of Standards.*

New Books

Reviews of the Latest Contributions to
Technical, Industrial and Commercial Literature of Particular Interest
to Members of the Electrical Industry

The Poulsen Arc Generator

By C. F. Elwell. New York: D. Van Nostrand Company. 192 pages, illustrated.

The principal types of commercial Poulsen arc generators are fully illustrated and their unique features commented upon by the author, although very little new theory concerning the operation is presented. The fact that the Dutch government is now installing in Java a 2,400-kw. arc, the largest ever built, is significant and should stimulate interest in this important field. The author calls attention to a small laboratory-type arc generator (120 watts) and its value in connection with laboratory measurements. The pure-wave frequency range is from 15,000 to 100,000 cycles. The bibliography is quite complete and is in itself a valuable feature. H. M. T.

Corrosion Tests and Materials of Construction for Chemical Engineering Apparatus

By W. S. Calcott, J. C. Whetzel and H. F. Whittaker. New York: American Institute of Chemical Engineers. For sale by D. Van Nostrand Company. 182 pages.

All industrial plants are confronted with corrosion problems. Some do not involve anything more serious than the protection of structural elements by occasional repainting. Others, particularly those encountered in the chemical industries, are of such major importance as to dictate the materials which may be used in each piece of equipment. As a result of these conditions many of the larger plants in the chemical industries have accumulated valuable data on the resistance of engineering materials to corrosive influences. An immense amount of information of this character, courteously released from their files for publication by E. I. du Pont de Nemours & Company, is contained in the two papers which have been reprinted from the *Transactions* of the American Institute of Chemical Engineers to form the volume under review.

Elektrotechnische Messinstrumente

Second edition. By Konrad Gruhn. 223 pages, 321 illustrations. Berlin: Julius Springer.

The volume contains in remarkably concentrated form a description of the principle of operation and the most important mechanical details of all electric measuring instruments used in laboratories and plants. In some cases theoretical considerations and vector diagrams help greatly to explain the proper function of such instruments as, for example, phase indicators for alternating current, etc. All auxiliary apparatus, like resistors, shunts, instrument transformers, planimeters, recording devices, relays, etc., have their proper place in the book. As is true of many volumes of this character, the author gives prominence to the products of certain manufacturers with whom he is connected—in this case Hartmann and Braun—but a sufficiently large number of instruments of other types are described to avoid a too conspicuous partiality. The paper, print and cuts are of the usual high standard of Springer. A. P.

Etude Mecanique et Usinage des Machines Electriques

By H. de Pistoye, Paris: J. B. Baillière et Fils. 840 pages, 802 illustrations.

In this weighty tome the author gives the electrical engineering profession something extremely useful and, in a way, new. The book deals with the many strictly mechanical problems which the designer of rotating electric machinery has to solve. Of course, the engineer whose daily task it is not only to calculate the electrical data for a new generator or motor, but also to give it properly dimensioned shafts and bearings, to provide sufficient safety against centrifugal forces and to care for the many other mechanical factors, knows where to find methods of procedure. He keeps on hand mechanical handbooks. These, however, rarely consider the problem in point from the electrical standpoint, and it is here that the author's book steps in, giving a remarkably complete treatise on all such mechanical details. As would be expected, mathematics and graphostatics are used freely throughout the book. A wealth of modern illustrations, many of which were published in technical magazines only last year, add greatly to the value of this comprehensive study of electrical machines. A. P.

Die Elektrotechnik und die Elektromotorischen Antriebe

By Wilhelm Lehmann. Berlin: Julius Springer. 448 pages, 520 illustrations, 116 examples.

In terms of the number of persons directly concerned in solving them, problems in electric power application probably far outweigh those of design or operation. With this thought in mind the author has produced an introductory textbook which, starting with a brief review of the elements of magnetism and electric currents and then taking up the functioning and characteristics of various kinds of power apparatus, never loses sight of the idea of industrial application. Theoretical electrophysics and mathematical proofs have been reduced to the vanishing point. The viewpoint throughout is that of the practitioner. The explanations are frankly elementary and will not appeal to the advanced student seeking a treatise on generators and motors, but for the beginner the frequent comparisons and the logical steps connecting related devices will be very helpful. As might be expected, the various types of alternating-current commutator motor get considerable attention. To a rather greater extent than is customary in textbooks of its class practical details are described and illustrated — power wiring, cables, switches, protective devices and relays among others. G. F. W.

Book Notes

Practical Calculus for Home Study. By C. I. Palmer. New York: McGraw-Hill Book Company. 443 pages, illustrated.

A book for the practical man who has gained a considerable knowledge of mathematics by home study and for those college graduates who need a good practical work on this subject. All useful features of the calculus are treated in a simple but thorough manner, and the book should be welcomed by a large number of operating engineers.

Stone & Webster "Black Book." Boston: Stone & Webster, Inc.

The yearly manual of financial data for public utilities under the management of Stone & Webster, Inc., Boston, has been published under date of 1924. It contains 107 pages and besides company statistics includes a number of useful maps and suggestions as to taxation requirements, stock transfers and yield tables.

Public Utility Laws of Massachusetts. By Allan Brooks, assistant secretary Department of Public Utilities, Boston. Privately published. 170 pages.

In 1914 the Massachusetts laws relating to the manufacture, distribution and sale of gas and electricity were compiled and published by the Gas and Electric Light Commission. Since then the commission has been succeeded by the Department of Public Utilities and various legislation enacted. These laws have been brought up to 1924 in Mr. Brooks' compilation. Certain chapters of the general laws relevant to public utilities have been included, and the special acts relating to the Boston Consolidated Gas Company and the Boston sliding scale are reprinted. The text contains present and former wording of the laws bearing upon public utilities and is supplemented by a twenty-six-page index.

Books Received

Tulley's Handbook—Steam and Electrical. Seventh edition. 3 vols. By Henry C. Tulley. Revised by James F. Hobart. New York: McGraw-Hill Book Company, Inc. 1,155 pages, illustrated.

Electrical Measuring Instruments. By C. V. Drysdale and A. C. Jolley. London: Ernest Benn, Limited. 440 pages, illustrated.

Metal Statistics—1924. Seventeenth annual edition. New York: The American Metal Market and Daily Iron and Steel Report. 528 pages.

News of the Industry

Chronicle of Important Events and General Activities, Announcements and Reports of Association Meetings, Court Decisions and Commission Rulings and News of Electrical Men

Committee Eleven to Five Against Ford

Norris Bill for Government Operation of Muscle Shoals Will Be Reported to Senate Instead—Final Action Likely to Be Deferred Until December

THE federal government will not sell its Muscle Shoals properties to Henry Ford. This deduction is made by most observers from the action of the committee on agriculture of the Senate, which on May 27 voted eleven to five against the McKenzie bill, which embodies the Ford offer. The committee then voted to report favorably Senator Norris's bill, which provides for a modified form of government operation.

Those who believe that the committee's action killed the Ford bill base their reasoning on the assumption that even should the Senate pass on the Norris bill, of which there is some doubt, the resulting conference between the two houses would end in a deadlock. Mr. Ford would not accept the compromise on which the Senate conferees would insist. In turn, the Senate would not accept a conference bill which would embody the few concessions which Mr. Ford might accept. It is expected, however, that the Norris bill will be taken up by the Senate during the week of June 2, which will mean that there will be extended discussion over the disposition of Muscle Shoals.

No votes were taken in the committee on the other offers. It was so apparent that all of them would be voted down that no member of the committee moved to report any one of them. A sub-committee consisting of Chairman Norris, Ransdell of Louisiana and McNary of Oregon was authorized to draft any amendments to the Norris bill deemed necessary to perfect it. The amendments, however, must be reported back to the full committee for approval. The principal provisions of the Norris bill are as follows:

The Secretary of War is directed to complete Dam No. 2 (the Wilson dam) and Dam No. 3. Surveys of reservoir sites with the idea of increasing the amount of primary power are ordered made. The Federal Chemical Corporation is created and authorized to use the power at the government's plants for the manufacture of explosives for the government and the manufacture of fertilizer for sale to the public. Any and all power not required for the nitrate plants may be sold. The corporation may establish agencies for the sale of its products "in order to prevent a monopoly of the fertilizer business or the undue or unreasonable advance in the price of fertilizer."

An amendment which Chairman Norris has in mind would provide for the use of the $3,472,487 which was received by the government for the sale of the Gorgas steam plant to the power company as working capital for the Federal Chemical Corporation.

Chairman Norris is reported as saying also that he probably will submit an amendment to turn over to the nitrogen research laboratory of the Department of Agriculture Nitrate Plants Nos. 1 and 2 for the production of fertilizer, instead of to the corporation, as the original bill provides.

Postponement Till December Likely

The majority of the Senate doubtless would vote to allow the government to operate the dam. But it is not believed that any proposal which would launch into the manufacture of fertilizer will be approved. As this is written it seems probable that Congress will adjourn June 7. It is thought that this will not allow enough time to perfect a bill which the Senate will approve. The probabilities are that the disposition of the matter will be allowed to go over until the December session.

The five Senators who voted to report the Ford bill favorably were Harrison of Mississippi, Heflin of Alabama, Caraway of Arkansas, Smith of South Carolina and Ladd of North Dakota. Senator Ralston of Indiana voted present. He does not approve of the Ford offer, but had committed himself in such a way that he felt he should not be a party to its defeat. There were four votes against the Norris bill. Senator Ladd voted for it, but Senator Keyes of New Hampshire voted against it and Senator Caraway joined Senator Ralston in voting present. The other votes against the Norris bill were those cast for the Ford bill.

It was admitted in the committee that the principal point influencing the majority was the need for the distribution of the power over as wide an area as possible. They were convinced that the sale of the properties to Henry Ford could mean nothing else than the consumption of all of the power at or near the dam.

Power Club Hears Swope

Progress in Standards Is Reported at Annual Meeting Held at Absecon, N. J.—Timmerman Re-elected President and J. M. Curtin Made Vice-President

ONE of the features of the Power Club meeting at the Seaview Golf Club, Absecon, N. J., this week was a constructive address by Gerard Swope, president General Electric Company. In a discussion of business ethics and principles which tend to make for stability and success, Mr. Swope urged greater business stamina and more complete confidence in one another by all elements of the electrical industry. He held this to be necessary to the steady advance of that industry—an advance in which not only the industry itself but also the public has a great interest. Though there may be some surplus manufacturing capacity today, Mr. Swope said, the saturation point has not been reached, and opportunity can be made to use this capacity to give even wider electric service to the public.

In his presidential address A. H. Timmerman analyzed the costs of labor and material entering into electrical manufactured products since 1914 and compared with these the selling prices, thus showing that while material and labor in the product, particularly motors, are 165 per cent of 1914 values, the motors are selling at 106 per cent of 1914 values. The rise in labor and raw material since the low point of 1922 was not accompanied or followed by a corresponding rise in motor sales price. This is an accomplishment, but it may have been overdone and thus lie at the root of some of the motor manufacturers' present difficulties.

W. A. Layman, president Wagner Electric Corporation, St. Louis, gave an instructive analysis of capital investment per dollar of gross business per year in the electrical manufacturing industry. Taking large and small concerns together, he found by analyzing annual reports an average of $1.44 for each dollar of gross business, divided as follows: Plant and equipment, 62.8 cents; cash or equivalent, 12 cents; accounts receivable, 22 cents; inventories, 38 cents; miscellaneous, 9.2 cents. In general, figures for larger companies exceed these and for smaller ones are less than these. Mr. Layman pointed out that these figures are larger than had been generally supposed and said that no one should consider entering the business or making expansions without full study of these facts.

In discussing foreign trade opportunities for electrical products, it was urged that American codes and standards should be widely distributed abroad and also that the Winslow bill,

now before Congress, which would give a more definite status to American trade representatives, be strongly supported.

In addressing one of the sections, R. J. Russell, vice-president Century Electric Company, St. Louis, urged closer inspection of product to see that standards and ratings are lived up to as completely as possible. He also advocated, among other things, that efficiency power factor and certain torque values be made part of the Power Club's motor standards.

On Tuesday evening the following were elected members of the board of governors: N. J. Conrad, Schweitzer & Conrad, Chicago; J. M. Curtin, Westinghouse Electric & Manufacturing Company; C. H. Strawbridge, Goodman Manufacturing Company, Chicago, and M. O. Troy, General Electric Company, Pittsfield, Mass. They will succeed James K. Bass, F. M. Kimball, J. F. Lincoln and S. L. Nicholson, whose terms expire by constitutional limitation. On Wednesday morning the board of governors met and re-elected A. H. Timmerman of the Wagner Electric Manufacturing Company president and J. M. Barr of the Louis Allis Company secretary. It elected also J. M. Curtin vice-president and N. J. Conrad treasurer.

Utilities and the Courts

Another Bill Introduced at Washington to Force Companies to Apply to State Tribunals

A BILL has been introduced in the House by Representative Dickstein of New York to prohibit any public utility company from bringing an action at law or in equity in a federal court unless such corporation shall have previously tried the case in a state court. In explaining his reasons for presenting this measure, which is the same in general purport as the measure introduced in the last Congress by Representative Bacharach of New Jersey and reintroduced by him in the sitting Congress but so far unacted upon, Mr. Dickstein said:

"As recently as the first day of May in the city of New York, upon an ex parte application, one of the district judges granted a 10 per cent increase to the telephone company without awaiting the determination of the Public Service Commission, on the theory that the company lost much money in the operation of its venture. This bill will prohibit all public utilities from bringing action or proceedings relating to rates or other charges to the United States courts at law or in equity unless such person or corporation has heretofore made an application to a state court having jurisdiction and such state court has finally decided the issue involved; and in the event some right that they may claim was not granted by the state court the public utilities may apply to the United States Supreme Court."

Another bill introduced by Representative Dickstein provides that the Interstate Commerce Commission shall have authority to fix rates for telephone, telegraph and cable service and to "prevent unjust discrimination and unreasonable preferences."

Sheriff Seizes Puget Sound's Property

Dispute Over Street-Railway Taxes for 1919 in Which Power and Light Company, City of Seattle and King County, Wash., Are Involved—Company Charges Oppression

IN AN effort to stay the confiscation and sale of its property in Seattle by the Sheriff of King County, Wash., for non-payment of the street-railway tax of 1919, the Puget Sound Power & Light Company this week filed with the United States District Court an application in equity asking for a temporary restraining injunction until after a hearing. The suit charges fraudulent and oppressive practices on the part of city and county officials.

Sheriff Starwich has seized two million dollars' worth of property in Seattle, including the executive offices of the company with their equipment and supplies, its central stations and substations, its transmission system and equipment and its automobiles and trucks, and the public sale of this property has been ordered for June 10.

HISTORY OF DISPUTE

The dispute is of several years' standing. The city purchased the street-railway properties of the company in March, 1919, and it has been determined in the courts that the power company is liable for the tax for the first quarter of the year 1919, or until the purchase date, and the city for the remaining period of the year. In accordance with this decision President Leonard informed County Treasurer Shields that the company was determined to pay only its share, or one-fourth of the tax. The total tax now amounts to $652,495, including interest from March 15, 1920, to May 20, 1924, which reaches $251,478 and is piling up at the rate of about $167 a day. Mr. Leonard offered to pay the company's one-fourth share direct to the county or to the city, which then could pay its taxes in whole.

The county takes the stand that the company is listed on the 1919 tax roll as owner of the railway property, and that in view of this fact the company alone is responsible to the county for payment of taxes and that any agreement between the company and the city for payment is foreign to the question. Since the company no longer holds title to the railway property, the County Treasurer declares that distraint proceedings can be instituted against the present property of the company.

Mr. Leonard, however, has notified him that the company will hold him responsible on his bond for any action taken, because in the opinion of the company the county has no right to charge any portion of such taxes against property of the company so long as the property upon which such tax is a specific lien is available.

The failure of the city to fulfill its contract with the company regarding the sharing of the 1919 tax was the result of an opinion furnished by Corporation Counsel Kennedy, who holds that the City Council is without authority to appropriate the necessary funds. Moreover, the Corporation Counsel asserts, the Council exceeded its authority when, in drawing the terms of purchase of the railway, it agreed to share the 1919 tax. Mr. Kennedy holds that neither the general fund nor the street-railway revenue fund may be tapped to provide the money and that a bond issue to meet the demand would not be legal.

A statement made by J. B. Howe, counsel for the Puget Sound Power & Light Company, summarizes the situation by saying that the city of Seattle admits making a contract to pay three-fourths of the tax, and by its ordinance prescribed a form of contract with such a provision. The Supreme Court of the state decided that the contract as prescribed was valid and decided further, when the city claimed that the property was exempt from taxation, that the city took the property subject to taxes and the property was not exempt. Now for the first time, Mr. Howe says, the city denies liability and refuses to pay.

Mayor Brown of Seattle says that he will suggest in his annual message to the City Council that the city acquire by purchase or condemnation transmission lines and other equipment of the company. Alton W. Leonard, president of the company, declares in reply that its properties are not for sale.

Mechanical Engineers Hear Electrical Papers

More than seven hundred delegates attended the spring meeting of the American Society of Mechanical Engineers, held in Cleveland this week from Monday to Wednesday. Among the papers of especial interest to the electrical industry were those dealing with pulverized fuel at the Lake Shore plant in Cleveland. This installation has come up to expectations, and the equipment more than satisfies the engineers in charge. Another valuable paper, by C. J. Fechheimer, Westinghouse Electric & Manufacturing Company, described the fan characteristics of ventilating electrical machinery. Tests showed that backward-curved vanes were most efficient.

The power problems of the steel industry were treated in a series of papers, and the assertion was made that a transmission line connecting several steel mills would be advantageous, but L. W. Heller, Duquesne Light Company, Pittsburgh, expressed the opinion that the economics of the situation dictated the use of interconnected power lines from central stations, with the individual steel mills receiving energy from or giving energy to the network according to the load conditions existing in their plants.

A paper by William LeRoy Emmet of the General Electric Company on the mercury boiler caused considerable discussion. The possibilities of windmill-power plants were outlined in another valuable paper. The industrial and management sessions were well attended with many good papers.

Credit Men's New Plan

Broader Functions Assumed at National Convention at Instance of President Shepard

THE presentation before three hundred delegates of the new "functional plan" fathered by President E. W. Shepard of the National Electrical Credit Association and its adoption at the twenty-sixth annual convention of that body, held in the Congress Hotel, Chicago, on May 22 and 23, marked a step in advance for the credit men of the industry. This "functional plan" provides for a larger growth of the association through improvement in system and service. It provides for the better application of credit in electrical companies in two ways—first, by increasing the national board of managers from six to ten members and assigning to each member a direct responsibility for one activity of the association, such as finances, service, service improvements, membership and publicity; second, by the creation of committees within the national board for each one of these divisions and the organization of similar committees in each local association, the chairmen of which will constitute the national committee. Changes in the by-laws to provide for the above plan and eliminate obsolete phraseology were also adopted.

QUALIFICATIONS OF CREDIT MANAGER

On Friday morning L. W. Lyons, Pittsburgh, dealing with the establishment of credit policies, declared that a true credit manager must use discernment in determining financial strength through qualities of character, enterprise and merit. Just as there was a limit beyond which a sale would be unprofitable, there was a limit beyond which credit should not be granted. Above all things, Mr. Lyons pleaded for a fixed credit policy that will permit no weakness when salesmen are hard up for orders.

Credit problems in the radio business were discussed by T. J. Whearty, National Carbon Company, who insisted that no change in general credit policies should be tolerated just because this phase of business is new. The discussion indicated that radio credit during the past year has become more stabilized than formerly and that dealers are not enthusiastic about overstocking this material, particularly in the summer time.

Howard A. Lewis, business manager of *Electrical Merchandising*, painted an effective picture of how credit managers could improve conditions within the industry by urging electrical dealers to become better acquainted with their bankers. With only about 10 per cent of the electrical dealers in the country availing themselves of adequate banking facilities, Mr. Lewis insisted that it was the duty of credit managers to act as liaison officers between the dealers and the banks. He pointed out that this was logical because the banker knows very little of the electrical business and the electrical dealers in turn very little about the advantages of banking service. The credit man, who knows both phases, should bring about a better acquaintanceship. By so doing the credit and business standing of electrical dealers would be improved and money would be kept in the locality, thus preventing the starting up of many "curbstone" dealers.

Forward-looking suggestions were made by Charles R. Oliver on Friday afternoon, and group discussions were held. Roland Cole, *Electrical Retailing*, spoke on the survival of the non-electrical dealers and declared that education was their greatest need in selling high-class merchandise.

E. W. Shepard, general credit manager Western Electric Company, New York, was unanimously re-elected president. The other officers elected are: Vice-president, Almon Foster, Foster-McDonald, Boston; secretary-treasurer, Frederic P. Vose; assistant secretary-treasurer, Walter S. Vose. All the present members of the national board of managers were reappointed and four new members added. The present membership is: E. W. Shepard, chairman; Benjamin P. George and A. F. Hearl (new), Central Division; Clarence Koeber and Franklin P. Bell (new), Middle and South Atlantic Division; S. B. Anderson, Pacific Coast Division; Almon Foster and Charles R. Oliver (new), New England Division, and Fred A. Booth and A. F. Thatcher (new) of the New York Electrical Credit Association.

Plans of Public Service of New Jersey Approved

Approval of the merger of the Public Service Electric Company, the United Electric Company of New Jersey and the Public Service Gas Company into a new corporation, to known as the Public Service Electric & Gas Company, has been given by the Board of Public Utility Commissioners of New Jersey. The plans for the readjustment of the financial structure of the Public Service Corporation of New Jersey and its subsidiaries, as announced by President Thomas N. McCarter, were summarized in the ELECTRICAL WORLD for March 22, page 592.

Operating Man Wins Edison Public Relations Prize

In a prize contest on "How Sound Public Relations Can Best Be Developed and Maintained," conducted by the Commonwealth Edison Company, Chicago, Richard Kunkel of the load dispatcher's office won the first prize of $200. Mr. Kunkel's paper brought out particularly the point that an individual employee was often regarded by the public as the company. He showed how better public relations can be obtained by the development of a public relations department, advocated the better instruction of telephone operators and dwelt on the need of a finer development of public spirit even among department heads.

The second prize of $100 also went to an engineer, Richard J. Grant, a member of the overhead distribution division, while the third prize of $50 went to Ernest F. Butt, advertising department. More than forty-three papers were presented by employees of twenty-one departments.

Superpower in New York

Eventual Union of Niagara, St. Lawrence, Mohawk and Adirondack Systems Predicted

A LINK of considerable importance in the chain that may eventually unite the systems of the principal companies supplying electricity in the State of New York will be forged when the present plans of the Northern New York Utilities, Inc., of Watertown are realized. This corporation, organized primarily to serve the inhabitants of the Black River watershed west of the Adirondacks, now generates or distributes energy in six counties. It has recently acquired the property and facilities of the Rome Gas & Electric Company and is extending its system to a point where physical connection with the Adirondack Power & Light Company would be possible. The Watertown company is to expend about $1,400,000 in improvements and extensions, the most important being a connection at Altmar, Oswego County, with the lines of the Niagara, Lockport & Ontario Power Company, thus permitting an interchange of power between Niagara and northern New York.

Simultaneously with this extension by the Northern New York Utilities, the Canton Electric Light & Power Company, in St. Lawrence County, has increased its capital from $38,000 to $150,000 and the St. Lawrence Transmission Company and the Oswegatchie Light & Power Company are asking the Public Service Commission for authority to construct large modern electric generating plants in the town of Gouverneur, on the Oswegatchie River.

Within the last few months the St. Lawrence County Utilities, Inc., has been formed. This is a combination of the Massena Electric Light & Power Company, the Potsdam Electric Light & Power Company, the Ogdensburg Power & Light Company and the Ogdensburg Gas Company. It acts as the distributing company for the St. Lawrence Valley Power Company, which is composed of the recently combined St. Lawrence River Power Company and the Hannawa Falls Power Company, the two last-named companies generating the electricity sold by the St. Lawrence County Utilities. The Northern New York Utilities, Inc., invades the territory of the St. Lawrence County companies for the development of power but not for its sale or distribution.

A PROPHESIED COMBINATION

The naturally expected sequence of events in the not far distant future is a combination of the Northern New York Utilities with the St. Lawrence County companies, which in turn may be consolidated with the Niagara, Lockport & Ontario Power Company. At that stage a consolidation with the Adirondack company would link the power systems of the Niagara, the St. Lawrence, the Mohawk and the Adirondacks together. The Adirondack company is developing and enlarging the territory it serves, reaching to the north, east and south for new sources of electrical energy but confining its activities for the most part to territory south and east of the Adirondacks.

Report to Council on Milwaukee Plan Expected Soon

Presentation to the Milwaukee Common Council of the final report which its special committee on the acquisition of public utilities has been preparing for more than a year in connection with the plan of the city to enter into a service-at-cost contract with the Milwaukee Electric Railway & Light Company for the operation of the company's electric and city car-line properties is expected to take place within the next month or two, according to an announcement by Fred S. Hunt, chairman of the committee, who said that obstacles which held up the completion of the report had been overcome.

Following a thorough study of the completed report and contract, the council is to determine whether or not to submit the question to the voters by referendum in November. In furnishing some light on the proposed contract Mr. Hunt declared that by its terms the city may, if it desires, eventually take over and operate the properties of the utility, the management to remain with the company until such time as the city has completed all preparations for acquisition. He added that the city will be authorized to invest money and obtain an equity in the company's properties at any time it may desire and in any amount that it may chose.

Model Electric Farm Display at British Empire Show

Some of the services rendered by electricity, particularly to farmers, are portrayed in the co-operative exhibit organized by the British Electrical Development Association at the British Empire Exhibition now being held in Wembley, near London. This exhibit has cost the various electric supply, manufacturing and contracting interests between $150,000 and $200,000. The exhibits of electrical and allied engineering companies are said to have cost in the aggregate, including attendance, about $5,000,000.

One of the chief novelties for the British public is the model electric farm arranged by R. Borlase Matthews, a member of the Institution of Electrical Engineers and England's leading expert in this branch of electrical activity, who has his own farm not far from London where all sorts of experimental and practical electrical work have been proceeding for several years past. The display which he has arranged at Wembley covers the stimulation of egg laying during the winter months by the employment of artificial lighting, milking cows by means of electricity, drying hay in the rick by electrically driven ventilating fans, electrically heated incubators, electric motors for operating churns, milk separators and vegetable choppers, and a windmill-driven electric generator for lighting and small power requirements where no public supply is available and demand does not justify the employment of oil or similar engines.

The combined display of the British Electrical Development Association in the Palace of Electricity includes a complete range of domestic and workshop appliances, lamps of every type, ornamental illumination, electric devices for ventilation and refrigeration, fans, elevator motor service and all the engineering equipment essential to the electrically appointed hotel or restaurant.

In the exhibition itself electricity supplies 2,000,000 lamps for the illumination of 216 acres of palaces and grounds.

Tripp Attacks Public Ownership of Superpower

In a vigorous address delivered on May 20 before the Engineering Society of Western Massachusetts at Springfield General Guy E. Tripp, chairman board of directors Westinghouse Electric & Manufacturing Company, assailed the Norris-Keller superpower public ownership bill, now before Congress, and pointed out the dangers of public ownership from the economic and social standpoints. General Tripp cited the impracticability of utilizing the Muscle Shoals plant, the Colorado River and the 2,318 municipally owned power plants of the country as the nucleus of a superpower system owing to the scattered location of these units. He showed that it would be necessary to increase the general tax rate in case a government-owned system of superpower supply should be adopted, pointed out that millions of horsepower are already being developed under the federal water-power act and demonstrated that by the development of superpower through private initiative under public regulation maximum profitable use of the investment, mass production and skillful marketing of the energy sold can best be attained. Upon the attainment of these ends the low cost of electric power in the future largely depends.

The speaker pointed out that a superpower system will add to the wealth of the country only in those sections where it is needed and only to the extent that it is needed. The sole test that can be applied is whether there will be enough demand to pay a return on the capital invested. If not, national wealth will be wasted. The government does not apply this test as effectually as private capital. No great industry would dare risk its future by depending on a government-owned system for its power because the contracts of such an agency can be nullified by political action.

Maine Man Talks Against State Water-Power Policy

Speaking before a recent meeting of the Maine Association of Engineers at Portland, Edward G. Lee of Auburn condemned the non-exportation policy of the state in emphatic terms and declared that Maine should become a part of the territory to be embraced in the "superpower" interconnected project for the North Atlantic seaboard states. Mr. Lee said among other things:

"I feel perfectly safe in assuming that with the load centers of the State of Maine tied into a large-capacity, high-tension transmission line connected with the superpower system as proposed, the price of power available from that line would be not over three-fourths of the price of the best hydro-electric power now undeveloped in the state if delivered to those same load centers. By our own wishes we have been left out of consideration in the superpower system, and we have thereby cut ourselves off from the most sure source of relatively cheap future power until we change our position. We do have some water powers left undeveloped in this state and they are unquestionably of some value, but they would also unquestionably be of more value to us all as well as to others if they were tied in a large system like the superpower system. Such tying together of plants makes it possible to develop the water powers very much more efficiently, in larger volumes and therefore at an appreciably lower cost. The chance of our attracting new industries to the State of Maine would be much better if our powers here were so tied in than would be possible by the present independent systems or even if all of the present companies in the state were tied together."

Expenditures Under Way by Wisconsin Central Stations

Wisconsin public utility managers plan to spend $26,769,179 to improve their services this year, according to Harold L. Geisse, retiring president of the Wisconsin Utilities Association, whose tabulations were submitted to the convention held at Milwaukee recently. He specified expenditures under way or contemplated by electric light and power companies as follows:

The Madison Gas & Electric Company will spend $591,071 to provide extensions and additions. The Wisconsin River Power Company has laid out $147,161 for purchase of flowage lands, for a new substation at Janesville and for improvements costing $59,500 at the Prairie du Sac and Kilbourn dams. The Eastern Wisconsin Electric Company has set aside $490,519 for improvements at Plymouth and Fond du Lac. The Wisconsin Power, Light & Heat Company plans to use $269,768 for building the Markesan-Dalton-Manchester transmission line extension and the Marquette transmission line extension and distribution system, rebuilding the Beaver Dam-Oak Grove power line, raising the voltage of the Red Granite-Wautoma power line and other improvements in large and small towns in central Wisconsin. The Wisconsin Utilities Company will spend $185,015 for the plant and lines of the Albany Electric Light & Milling Company, to build a new transmission line connecting Orfordville, Monroe, Evansville and Brodhead, and for improvements to the Monroe-Martintown power line. The Janesville Electric Company will spend $69,510 for improvements, extensions and new equipment in Edgerton, Orfordville and Janesville, and the Mineral Point Public Service Company $37,652 for line extensions at Mineral Point.

Against Public Ownership

Committee of National Utilities Commissioners Reiterates Views of That Body

THE National Association of Railway and Utilities Commissioners' committee on public ownership and operation, first appointed in 1917, has since that year rendered annual reports in which it has been held that such ownership and operation have proved neither practicable nor justifiable. The report of the committee appointed last fall, under the chairmanship of Harvey H. Hannah, who is also chairman of the Tennessee Railroad and Public Utilities Commission, has now been published. In it the committee reiterates the stand taken in other years and points to the reaction against public ownership of utilities that has taken place in several countries where it has in some degree prevailed. On the electric industry the report of the committee says in part:

"The electric industry stands, as it always has, upon a most secure foundation. Although only forty years of age, it has already grown into one of the greatest industries in the world and bids fair soon to achieve prominence as the greatest. Certainly it is the greatest with respect to production of power. Attention was called in our last report to the rapid strides of this industry and to the growing interest in superpower and interconnection. . . .

"It is apparent to your committee that the superpower structure which is now well under way will be finally developed by the so-called privately owned electric light and power companies under state regulation and through co-operation of the various state commissions in the superpower zones. So-called superpower, which is really the building of large steam and hydro-electric plants and their interconnection, will do much for the farmer as well as for industry. . . .

MUNICIPAL VERSUS PRIVATE PLANTS

"Municipal ownership of electric light and power is conceived to furnish service to the inhabitants of the municipality, and there can be no successful interconnection of municipal electric light and power plants which will serve the rural population and carry to the farmer and his family the conveniences of the city and of other industries. In view of the rapidly increasing municipal and state indebtedness due to purely governmental functions, it should at once be apparent that the public utilities should be owned and developed through private capital and regulated by the state, rather than an attempt by the government to enter into this business with the increased tax burden which necessarily follows and which is ordinarily accompanied by inefficient management and stagnation.

"In no other industry is there such a diverse ownership by the public. No less than two million stockholders own the electric light and power companies, of which more than six hundred thousand own the securities of the companies directly serving them. . . . Every bank depositor and every policyholder is an indirect owner.

"It is interesting to note that the Bureau of Labor Statistics of the United States Department of Labor in a recent report stated that in spite of constantly increasing costs of labor, construction and materials the average electric light and power rate in the United States is 5.1 per cent lower than in 1914. . . .

"In 1922 there were 1,992 municipal electric plants in the United States serving 2,031 communities having less than 7 per cent of the population of the country; of these 1,446 generate their energy, 47 both generate and purchase energy, and 499 purchase energy from private companies. There were 4,106 private companies serving 93 per cent of the population of the country. The private companies produced 96 per cent of the electricity and the municipal plants 4 per cent. According to the United States Census of 1917 the kilowatt-hour generation of the municipal plants decreased from 4.9 per cent of the total in 1907 to 4.1 per cent in 1917. About 560 municipal electric plants have been either abandoned or sold to private companies.

"As to comparative rates of electric plants the latest United States Census stated: 'The average rates received by municipal plants for their current are much higher than those charged by the other group, as is indicated by the fact that, while they sell only 4 per cent of all current, they receive 7.9 per cent of the income from the sale of current.' The census also is eloquent on the subject of the practice, or lack of practice, on the part of municipal officials in keeping records or figures of operation."

Houston's New Station

First Section of Deepwater Power House on Ship Channel Is Rapidly Nearing Completion

TEN miles from Houston, Tex., on the ship channel, the first section of a new oil-burning generating station is rapidly nearing completion which will become the base-load plant of the Houston Lighting & Power Company. The first section will contain two 20,000-kw., 11,000-volt turbo-generators and two rows of three 20,000-sq.ft. oil-fired boilers. Concrete stacks, 362 ft. high, built to withstand high wind pressures, will serve the furnaces, each being sufficient for six boilers. Air preheaters are being installed. Feedwater heating and complete heat balance are obtained by bleeding the turbines at the third, seventh and eleventh stages. A house-turbine generator will float on the line, all auxiliaries being motor-driven. Owing to the sluggish flow of water in the ship channel, spray ponds will have to be used with the second section for circulating water as the water from the channel reaches 91 deg. in the summer.

Energy will be stepped up from 11,000 volts to 33,000 and 66,000 volts for transmission by the same transformers, they being of the two-coil type but with an auto-transformer type of secondary. The high-tension equipment is outdoors and is fed at generator voltage through cables carried underground in tunnels. At each transformer location a chimney rises from the tunnel, providing an outlet for the circuit. To avoid duplication of the high-voltage circuit breakers, provision is made for shunting them with motor-operated disconnecting switches when they must be taken out of service. For the present two 33,000-volt lines will connect with the Gable Street generating station, which will become a main receiving substation and reserve generating station when the new plant is placed in operation. The ship channel crossing involves a span of 1,045 ft. with towers 288 ft. high, a water clearance of 203 ft. and a sag of 40 ft.

Construction for the new station was started last August, and it is expected that the plant will be ready for operation by July.

DEEPWATER OIL-BURNING STATION TO BE IN OPERATION BY JULY

Date of Paris Conference on Power Distribution

In a letter to Dr. C. O. Mailloux of New York the organizers of the Paris conference of producers and distributors of electric power say that, much to their regret, it will be impossible for them to change the date of the conference from the early days of July—probably from July 4 to July 7—in order to avoid conflict with the World Power Conference to be held in London from June 30 to July 12. It is pointed out in this letter that the date of the Paris conference was fixed first and at a time when information on the London conference was to the effect that the British meeting would be held in the spring. The organizers of the Paris meeting hope that no great inconvenience will arise from the dates they will set, saying in this connection:

"It should be noted that our conference will be very different from the World Power Conference. The latter will be substantially, as its name indicates, a conference on power, and it would deviate altogether from its program if it were to undertake to discuss questions of power distribution. Our conference, on the other hand, is to be a gathering of producers and distributors of electric power, and the question of the production of power, properly speaking, will play only a very small part, the work being centered almost exclusively on the subject of the distribution of electric power."

Rural Electrification a Leading Topic of A. S. A. E.

The rural electrification program for the eighteenth annual meeting of the American Society of Agricultural Engineers, to be held at Lincoln, Neb., June 18, 19 and 20, will reflect in a broad way the present status of electric service on the farm, not only in this country but for the entire world. An entire day, June 19, will be devoted to this topic.

A paper by R. W. Trullinger, United States Department of Agriculture, entitled "Some Research Features Involved in the Application of Electricity to Agriculture," will consider "what to investigate and how to do it" and will be discussed by five of the leading agricultural engineers of the country. R. A. Lundquist, who has charge of the foreign rural electrification survey now being made by the Department of Commerce, will deal with "Electricity in Agriculture Abroad." Results of the Department of Agriculture's work in collecting, digesting and preparing for publication all available information relating to farm power will be presented by C. D. Kinsman, who was employed by the department especially for this work.

G. C. Neff, vice-president, of the Wisconsin River Power Company, secretary of the Committee on the Relation of Electricity to Agriculture, will discuss "The Relation of Water Power to Electrical Development." The report of the A. S. A. E. committee on rural power lines will be presented by the chairman, C. A. Atherton, engineer with the National Lamp Works of the General Electric Company. It will contain a summary of the work being done in various states.

Porto Rico Water Power

Maximum Present Development Is 14,650 Hp., with 9,500 Hp. Under Way and 10,000 Hp. Projected

FROM Frederick Krug, the superintendent of hydro-electric plants belonging to the Porto Rico Railway, Light & Power Company, Bayamon, comes the following information concerning the numerous possibilities that exist for small water-power developments in nearly all parts of Porto Rico, the greater portion of which are being considered in connection with irrigation projects. Owing to the comparatively small area of the island, no large outstanding water-power developments are possible. The streams are subject to wide variations in flow, a characteristic common to most tropical rivers. Because of this fact and the limited area drained, all the developments with but one or two exceptions require considerable storage capacity to make them feasible.

EXISTING AND POTENTIAL WATER-POWER DEVELOPMENT IN PORTO RICO

Plants in Operation

	Hp.
Porto Rico Railway, Light & Power Company:	
Comerio Falls (two plants, seven units)	10,600
Porto Rico Irrigation Service:	
Carite (two plants, three units)	2,850
Municipal and private plants not included above, about	1,200
Total	14,650

At the Comerio Falls plants 2,700 hp. is available 90 per cent of the time and 5,000 hp. is available 50 per cent of the time. At the Carite plants full capacity is available continuously owing to storage for irrigation purposes.

Plants Under Construction and Proposed

	Hp. Available 90 per Cent of Time	Hp. Available 50 per Cent of Time
Under construction:		
Rio Blanco development at Naguabo	2,800	5,000
Porto Rico Irrigation Service	1,400	2,100
Isabela Irrigation Service	1,400	1,400
Lajes irrigation project	1,000	1,000
Total	6,600	9,500
Other projects	6,000	10,000

The present installed capacity of turbines and waterwheels on the island is shown in the accompanying table, which gives a total present maximum capacity of 14,650 hp. and rates the plants under construction at 9,500 hp. for half the time, the total installed and potential power available 90 per cent of the time at about 19,000 hp., and the total power installed and potential power available 50 per cent of the time at about 28,000 hp.

A hydrographic survey of the island is now under way, but is still in the exploration stage. This survey is expected to yield data on which the major portion of the future power and irrigation developments in the island may be based.

Briefer News

Eastern Maine Has Electrical League.—The electrical interests in eastern Maine have organized an electrical league under the name of the Eastern Maine Electrical Board of Trade. The league is an outgrowth of a community electrical exhibit held in Bangor in March of this year. W. G. Burrill of the Bangor Railway & Electric Company is president.

Another New York Village to Discontinue Municipal Plant.—Newark Valley, Tioga County, N. Y., is to go out of the municipal electric light and power business as soon as the Public Service Commission authorizes the Binghamton Light, Heat & Power Company to take over the property of the village for $20,000. At a special election in Newark Valley the proposal was adopted by a vote of 145 to 5.

Seattle's Municipal Customers Want Lower Rates.—A protest against the proposed sale of 25,000 kw. a year of Skagit hydro-electric energy to the Puget Sound Pulp & Paper Company for $400,000 by the city of Seattle has been voiced by the Rainier Valley Home Protective Association, which urges that if the city can sell power to one company at such a rate, it can reduce rates to 74,000 individual users of its lighting service.

Three Companies Compete for Franchise in an Oklahoma Town.—At an election held at Hobart, Okla., on May 15 a franchise to furnish electricity to the city was voted to the Inland Utilities Company of Kansas City, Mo. The franchise of the Hobart Electric Company, which had been giving service to the city for many years, expired March 4. Shortly thereafter the Inland Utilities Company and the Gantt-Baker Company of Oklahoma City became applicants for the franchise. At the election the Inland company received 614 votes as against 295 for the Hobart company, the Gantt-Baker Company running third with a small vote.

A Year's Gain in San Francisco.—The total electric sales of the Pacific Gas & Electric Company, San Francisco, for the month of April showed an increase of 15.11 per cent over April, 1923. Sales for the year to date have increased 32,850,869 kw.-hr., or 12.53 per cent over the corresponding period of 1923. The principal increases were in mining, 19.22 per cent; manufacturing, 14.47 per cent, and miscellaneous power, heating and cooking, 17.78 per cent. The large increase in irrigation load due to the dry season was also an important factor.

International Interconnection for North Middle West.—Attempts were recently made to open negotiations with the Manitoba government for the supply of hydro-electric power to one Minnesota and three North Dakota

towns. C. F. Blackman of the Pembina (N. D.) Light & Power Company, which supplies Pembina, Neche and Bathgate, N. D., and St. Vincent, Minn., conferred with the provincial authorities with this object in view. The Pembina Light & Power Company now wholesales electrical energy to Gretna and Emerson, Manitoba, while the provincial hydro-electric system extends to Moran, 40 miles from Gretna, where it is planned to have it "tie into" the system of the United States company.

Rural Service Bill Introduced in the United States Senate.—Senator Ransdell of Louisiana has introduced in the Senate at Washington a bill providing for the gathering of information necessary to a comprehensive plan for the development of the water resources of the United States "for the purpose of providing electric power for farms, rural communities, cities and industries." This bill has the indorsement of Executive Secretary Merrill of the Federal Power Commission, who wishes the government to undertake on other streams investigations similar to the one it is now conducting on the upper Tennessee.

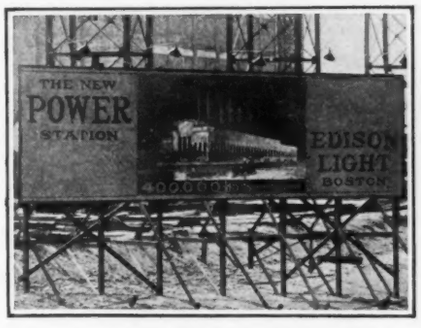
Michigan Electric Association to Meet in September.—Plans are under way for what is expected to be the largest gathering of Michigan electric and gas utility men in the history of the Michigan Electric Light Association and Michigan Gas Association. About four hundred delegates and guests are expected at the joint convention of these two organizations. The meeting will be held in Detroit, September 9 to 11. Both public relations and technical problems will be discussed. Samuel B. Tuell of the Houghton County Light & Power Company is president of the electric association.

Holtwood, Pa., to Have New Power Plant.—Interests identified with the Pennsylvania Water & Power Company have formed a new company capitalized at $3,500,000 for the purpose of building another power plant at Holtwood, Pa. The new plant will adjoin the existing plant of the Pennsylvania Water & Power Company and will be tied in with lines serving the Consolidated Gas, Electric Light & Power Company of Baltimore. It will go into operation early in the spring of 1925. It will have an ultimate capacity of 100,000 kw. with an initial installation of 20,000 kw. Contracts for two units have been placed in New York and work will begin at once.

Nipigon Plant of Ontario Hydro Has 60,000 Hp. Ready.—Agreements have been signed at the Ontario Hydro-Electric Power Commission offices under which its Nipigon power development is assured of a load of 60,000 hp. at $21 per horsepower. During the summer 50,000 hp. will be available for use, which, with two 13,000-hp. units on order, will bring up the capacity during next winter to 76,000 hp. By 1926 it is believed that the plant will be in a position to produce 80,000 hp. for the use of the municipalities of Port Arthur and Fort William, the pulp and paper companies and the grain elevators, all of which are developing a greatly increased capacity for consumption of hydro-electric power.

Mississippi Power & Light Company Acquires Tupelo Plant.—The Mississippi Power & Light Company announces the acquisition of the power station of the Tupelo Cotton Mills, Tupelo, Miss. The company has contracted to furnish the mills with their requirements for electric power and also to supply to the city of Tupelo its requirements, which include power used for pumping the city's water supply. Until such time as the power station acquired from the Tupelo Cotton Mills can be enlarged the company will operate the city station.

Picturing a Coming Plant for the Passerby.—On the site of the new Weymouth station of the Edison Electric Illuminating Company of Boston, a picture of which in course of erection was shown on page 1102 last week, the company has erected an illuminated



billboard on which is mounted a drawing of the plant in its ultimate form, thus attracting the attention of every passerby both to what the unfinished structure is and what it will be.

France Establishes a College of Electricity.—A new association in Paris has founded the Ecole Supérieure d'Electricité, which has for its object the extension of education in the electrical art throughout France, its colonies and protectorates. It will be aided in finance and administration by the Société Française des Electriciens and will be allied with the Laboratoire Central d'Electricité. The capital will be 5,000,000 francs in shares of 1,000 francs each and among the shareholders are the principal manufacturers of electrical equipment in France, including the French Thomson-Houston Company, the General Wireless Company, the Compagnie Générale d'Electricité, the Société d'Electricité de Paris and the Société Industrielle des Téléphones.

St. Cloud, Minn., Looks for Electrical Future.—St. Cloud, Minn., a city of 16,000 people, expects in the near future to be the center of the most important hydro-electric projects on the upper Mississippi River. Three new dams are projected and the one now existing at St. Cloud will be rebuilt. This will make six dams in the 50-mile stretch from Elk River to Little Falls—at Elk River, St. Cloud, Sartell, Rice, Royalton and Little Falls respectively. The average production of these dams will be from 40,000 hp. to 45,000 hp. The Pike Rapids dam will have a 45-ft. head and will cost about $3,000,000. At Rice plans call for a dam with a 25-ft. head and an investment of $2,000,000. Development of plans for the Clearwater dam already are under way.

Rural Service in Wisconsin.—An experimental electric line is to be built out of Ripon, Wis., by the Wisconsin Power & Light Company to serve eleven farms at first. The Wisconsin College of Agriculture will direct and supervise the experiment as well as compile and analyze the data gathered. Another step in rural electric development is to be taken by the State Department of Agriculture, which will make a survey of 850 small water powers of the state to determine whether they are paying a profit to their owners and whether further development of such installations would aid the business and agricultural development of Wisconsin.

Prone Pressure Saves Twelve Lives in Ten Years at Pittsfield.—An average of more than one life per year has been saved during the past decade by the use of the prone-pressure method of resuscitation at the Pittsfield (Mass.) works of the General Electric Company, according to S. W. Ashe, director of the educational and welfare department. The company is co-operating with local organizations to teach this method to all teachers and pupils in the public schools. Lectures and demonstrations are given by Mr. Ashe, who asserted recently to a representative of the ELECTRICAL WORLD that experience at Pittsfield demonstrates the importance of keeping the hands on the body while working on a person who has been shocked. He pointed out that the N. E. L. A. illustrations of the prone-pressure method show the hands raised from the body in the third position, which is not believed to be as good practice as the continuous contact.

National Hydraulic Laboratory Favored.—Testimony in support of Senator Ransdell's bill proposing the establishment in Washington of a national hydraulic laboratory was given before the commerce committee of the Senate recently by Dr. Elwood Mead, the Commissioner of Reclamation; N. C. Grover, chief hydraulic engineer of the United States Geological Survey, and L. W. Wallace, executive secretary of the American Engineering Council. Dr. Mead declared such a laboratory could be used in connection with the large number of water problems which confront the Reclamation Service. Mr. Wallace told the committee that he had discussed the matter with engineering societies in many states without having heard a single voice raised against the proposition. It is the consensus of opinion among engineers, he declared, that such a laboratory should be established. Secretary Hoover supported the proposal by letter.

Potential Power on Arkansas River in Colorado.—Nineteen power projects are possible on the Arkansas River in Colorado, according to a report prepared by an engineer of the Department of the Interior, Geological Survey.

These projects will represent a total potential output of 44,000 hp. for 50 per cent of the time and 24,000 hp. for 90 per cent of the time. The use of the water for power, however, is secondary to its use for irrigation. Six reservoir sites were found, but owing to the high cost of construction only two are considered feasible at present. One of these is on the East Fork of the Arkansas River near Leadville, where a dam 100 ft. high would create a reservoir having a capacity of 10,000 acre-feet. The other site is at Twin Lakes, where a 75-ft. dam would create a reservoir having a capacity of 130,000 acre-feet. The Twin Lakes reservoir could supply water for both power and irrigation.

Duquesne Light Company to Spend $10,000,000 in Pittsburgh District.—A program of expansion involving $10,000,000 has been adopted by the Duquesne Light Company of Pittsburgh. Several substations to be completed before next winter are to be built, and in addition new feeders from the Brunot Island power station and a complete revamping of the downtown underground system is planned. Work on a 10,000-hp. substation in the Schenley district has already been started. It will cost approximately $400,000 and be architecturally in keeping with the high-class residential community. In McKeesport a modern substation of 50,000 hp. will be erected and a substation will be erected in Beaver Falls with a rating of 30,000 hp.

Crossed-Coil Beacon to Guide Ferryboats.—The crossed-coil radio beacon developed at the Bureau of Standards has been suggested as a means of guiding ferryboats across San Francisco Bay in foggy weather, and the bureau believes it will prove very useful for that purpose. This type of beacon marks out a line in the ether and a boat equipped with an ordinary receiving set can tell whether or not she is on that line and to which side she is off. The beacon consists of two coil antennas crossing each other at an angle of 135 deg. A coil antenna gives its loudest signal in the plane of the coil and its weakest signal in a line perpendicular to that plane. On a line bisecting the 135-deg. angle the signals from the two coils would be of equal intensity, while if the receiving set is moved to either side the signal from one coil becomes louder than the other. The coils are connected alternately to the sending set, and one of the two signal letters is sent over each coil. The operation is automatic, the letters alternating rapidly.

New Company Organized in Iowa.—Don M. Sterns, vice-president and manager of the Northern Iowa Gas & Electric Company, and his associates have completed organization of a new utility company, to be known as the Northwestern Light & Power Company, which has purchased properties north and west of Humboldt, Iowa, including plants at Lake Park, Harris, Hull, Ocheyedan, Ashton, Boydon and Alvord. It is also negotiating for purchase of other plants. Plans are being drawn for a central station at Humboldt.

Seventy-Year-Old Mills Keep Up to Date.—The Northeastern Iowa Power Company of Clermont, Iowa, has acquired controlling interest in the People's Electric Service Company of Elkader. The two companies became interconnected a few months ago when the People's Electric Service Company built a line to Volga, where the Northeastern Iowa Power Company has a subsidiary plant. By this consolidation two of Iowa's one-time flour mills, long converted into hydro-electric stations, become the joint home of a company capitalized at more than $2,000,000. The two ancient mills, both of stone, stand 20 miles apart on the banks of the Turkey River. They were built back in the forties and fifties. A view of the Elkader station appeared in the ELECTRICAL WORLD for February 17, 1923, page 414.

Coming Meetings of Electrical and Allied Societies

[A complete directory of electrical associations is published in the first issue of each volume. See January 5 issue, page 72, for latest list.]

Electrical Supply Jobbers' Association—Homestead Hotel, Hot Springs, Va., June 4-6. Franklin Overbagh, 411 South Clinton Street, Chicago.

Northeastern Division, A. I. E. E.—Polytechnic Institute, Worcester, Mass., June 5-6.

American Association of Engineers—San Francisco, June 11-13. C. E. Drayer, 63 East Adams St., Chicago.

Canadian Electric Association—Ottawa, Ont., June 11-13. Louis Kon, 311 Power Bldg., Montreal.

North Central Division, N. E. L. A.—Winona, Minn., June 11-13. H. E. Young, Minneapolis General Electric Company, Minneapolis.

Pennsylvania State Association of Electrical Contractors and Dealers—Allentown, Pa., June 11.

Arkansas Utilities Association—Hotel Eastman, Hot Springs, Ark., June 12-14. R. I. Brown, Arkansas Central Power Company, Little Rock.

Associated Manufacturers of Electrical Supplies—Hotel Ambassador, Atlantic City, N. J., June 16-20. Frederic Nicholas, 30 East 42d St.

American Society of Civil Engineers—Pasadena, Cal., June 16-20.

Pacific Coast Electrical Association—Hotel Coronado, Coronado, Cal., June 17-20. S. H. Taylor, 527 Rialto Bldg., San Francisco.

Georgia Electrical Association—East Lake Country Club, Atlanta, June 18-19. W. C. Drake, 75 Marietta St., Atlanta.

American Society of Agricultural Engineers—Lincoln, Neb., June 18-20.

Empire State Gas and Electric Association—Commercial Section, Buffalo and Niagara Falls, June 19-20. C. H. B. Chapin, Grand Central Terminal, New York.

Wyoming Utilities Association—Casper, Wyo., June 23-24. H. C. Chappell, Natrona Power Company, Casper.

American Institute of Electrical Engineers—Annual convention, Edgewater Beach (Chicago), June 23-27. F. L. Hutchinson, 33 West 39th St., New York.

American Society for Testing Materials—Chalfonte-Haddon Hall Hotel, Atlantic City, N. J., June 23-27.

Iowa Section, N. E. L. A.—Wahkonsa Hotel, Fort Dodge, June 24-26. M. G. Linn, Des Moines Electric Co., Des Moines.

National Council Lighting Fixture Manufacturers—Atlantic City, N. J., June 25-27.

Society for the Promotion of Engineering Education—University of Colorado, Boulder, Col., June 25-26. F. L. Bishop, University of Pittsburgh, Pittsburgh.

Northwest Electric Light and Power Association—Gearhart Hotel, Gearhart, Ore., June 25-27. G. H. Gueffroy, Pacific Power & Light Company, Portland.

American Physical Society—Stanford University, Cal., June 26.

Association of Municipal Electrical Utilities of Ontario—Niagara Falls, Ont., June 26-28.

Ohio Electric Light Association—Hotel Breakers, Cedar Point, Ohio, July 8-11. D. L. Gaskill, Greenville, Ohio.

East Central Division, N. E. L. A.—Cedar Point, Ohio, July 9. L. B. Herrington, Kentucky Utilities Co., Louisville.

Rapid Electrical Progress of France.—Recently issued statistics say that of the 9,000,000 maximum hydro-electric horsepower available in France nearly 2,000,000 hp. has already been harnessed, and it is expected that by the end of the year the total will have reached 3,000,000 hp., with an estimated saving of coal amounting to 18,000,000 tons a year. More than two hundred applications for water-power development are on file with the Public Works Department, which will add 1,500,000 hp. to the present output, and in the Maritime Alps alone four sites are under development whose total production will be 500,000 hp. Twenty years ago, the statistics say, only 200,000 hp. was produced in France from hydro-electric plants. It is predicted that the output will reach 4,000,000 hp. within the present decade.

Maine Central-Station Company to Change Hands.—It is officially stated that arrangements have been made by A. R. Gould, president of the Gould Electric Company of Presque Isle, Me., and his associate majority stockholders in that company to sell their interest in it to a large public utility corporation whose name is not yet announced. Provision has been made for the minority stockholders to dispose of their holdings to the same purchaser if they so wish. Control of the Maine & New Brunswick Electrical Power Company, which has also been held by the Gould interests, will be disposed of at the same time. This company, with headquarters at Presque Isle, Me., serves Aroostook Junction and Perth and wholesales energy to Andover and Grand Falls, all these places being in New Brunswick, the rest of its output being taken by the Gould Electric Company. An electric railway across north Maine is said to be contemplated by the purchasers in accordance with former plans of Mr. Gould.

Rocky Mountain Rail Electrification Proposed.—Electrification of the Canadian Pacific Railroad through the Rocky Mountains, instead of double-tracking the lines, is favored by E. W. Beatty, president of the railroad, as a method of increasing its capacity. He said last week on returning East from Vancouver, after a trip of inspection: "Double-tracking the line would involve enormous expenditures. The question of double track is linked up with the question of electrification, and I would personally favor the latter method. Investigations looking to electrification through the mountains are proceeding slowly. They involve the collection of an enormous amount of data and the consideration of various sites and sources of power supply. As soon as the engineers' work is completed a decision will be made and final plans put in our hands. No announcements as to the work to be done or where it will be done can be made until then."

Men of the Industry

Changes in Personnel
Accomplishments, Responsibilities, Honors, Appointments and Activities of Men Engaged in all Branches of the Electrical Industry

D. C. Shain, for the past three years local manager for the Ohio Power Company at Tremont, Ohio, has resigned, effective June 1.

J. Lyman Gollegly, Sunday editor of the Utica (N. Y.) *Observer-Dispatch,* has resigned to assume charge of the publicity department of the Utica Gas & Electric Company.

R. D. Field, formerly associated with the New England Power Company, Worcester, Mass., has affiliated himself with the Blackstone Valley Gas & Electric Company, Pawtucket and Woonsocket, R. I, as structural designer.

R. H. Garrison, formerly identified with the United Electric Light & Power Company, New York, has become assistant manager of the Citizens' Gas & Electric Company, Waterloo, Iowa. Mr. Garrison will take over a large part of the detail from the office of General Manager Austin Burt.

F. R. Merris has been appointed manager of the Huron (S. D.) Light & Power Company, recently acquired by the Albert Emanuel Company, Inc., succeeding J. A. Ward, who has assumed larger responsibilities. The Huron company will become part of the Northwestern Public Service Company system and will be known as the Huron division.

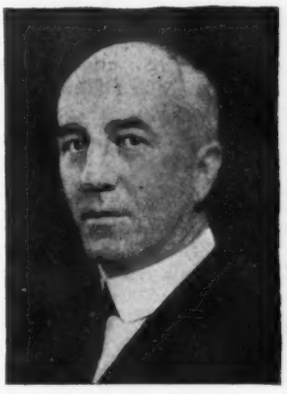
C. H. Wheeler of Gary, Ind., has been made head of the industrial agents' department recently organized by the Indiana Gas & Electric Company. Mr. Wheeler has had several years' experience in similar work in the East. For the past fourteen years he has been connected with the Illinois Steel Company at the Gary works as superintendent of blast furnaces and docks, and previous to this association was vice-president and general manager of the Jackson Iron & Steel Company of Jackson, Ohio.

H. E. Vordermark, formerly secretary and treasurer of the Indiana Service Corporation, Fort Wayne, Ind., has been made vice-president and treasurer in charge of finances and purchasing in the reorganization of the executive staff made necessary by the recent resignation of S. W. Greenland, vice-president and general manager. Mr. Vordermark has been associated with the company and its predecessors since 1893, when be became secretary to the vice-president and general manager of what was known at that time as the Fort Wayne Electric Railway.

Walter H. Sammis has joined the power sales staff of Charles H. Tenney & Company, Boston, after spending about two years as general power engineer of the Consumers' Power Company, Jackson, Mich. Mr. Sammis was graduated in electrical engineering from Columbia University in 1917. Prior to this he worked in the operating department of the Public Service Electric Company, Newark, N. J., and on the Brooklyn Rapid Transit system. From 1917 to the fall of 1919 Mr. Sammis was in the United States naval service, his work including oversight of electrical laboratories at the school for submarine chasers and the naval gas-engine school. He prepared a textbook at this period on aircraft ignition equipment. In 1920 he became an instructor in electrical engineering at Columbia, later joining the Consumers' Power Company as assistant electrical engineer.

P. S. Arkwright New N.E.L.A. Vice-President

Preston S. Arkwright, who was elected fourth vice-president of the National Electric Light Association at the convention held last week in Atlantic City, has been president of the light and power company in Atlanta for twenty-two years. At a time when he was practicing law in Atlanta, following his graduation from the University of Georgia Law School, Mr. Arkwright became associated with the electrical industry as one of the attorneys for the company operating in Atlanta. Later the wide knowledge of company affairs he had thus acquired, coupled with his legal attainments, eminently qualified him for the office of chief executive, to which he was elected in 1902. The company was then known as the Georgia Railway & Electric Company, and when in 1912 its property was leased to the Georgia Railway & Power Company he continued in the presidency. Mr. Arkwright has been a prominent member of the executive committees of the National Electric Light Association and of the American Electric Railway Association as well as an officer in many industrial organizations. Though a native of Savannah, he has been a resident of Atlanta since 1891.



P. S. ARKWRIGHT

Otto Bock, formerly deputy United States district attorney, has been appointed to fill the unexpired term of the late Judge Tully Scott on the Colorado Public Utilities Commission.

Roy C. Stallings, who was sales representative on the Parsons division of the Kansas Electric Power Company for the past two years, has been transferred to Council Grove, Kan., as superintendent of that division.

S. S. Hovey, member of the partnership of Shepherd & Hovey, consulting engineers of Chicago, recently dissolved, has opened offices as consulting engineer for industrial power design, street lighting and transmission systems.

Walter Smith, assistant superintendent of the Washington Coast Utilities branch of the Puget Sound Power & Light Company, has resigned to take up work with the Mountain States Power Company of Albany, Ore.

Harold Henderson, who has been associated with the New Bedford (Mass.) Gas & Edison Light Company for the past five years as advertising manager, recently severed his connection with the company to join the Brooklyn (N. Y.) Edison Company.

Francis L. Searway, formerly of the staff of Dwight P. Robinson, New York, and more recently appraisal engineer with Morgan & Morgan, Boston, has joined the appraisal division of Stone & Webster, Inc., Boston.

David MacNaughton, formerly consulting electrical engineer of Fort Wayne, Ind., is now manager of the Columbus (Ind.) properties of the Interstate Public Service Company. Mr. MacNaughton's previous work brought him in close contact with the Indiana Public Utility Commission on valuation matters.

Charles E. Warwick, director of safety of the electric light and power, gas, city and interurban railway properties of the Wisconsin Public Service Corporation in Wisconsin, with headquarters in the Green Bay office, has been granted an indefinite leave of absence from his duties to recover his health. Pending his return the direction of safety work will be handled from the Milwaukee office.

R. F. Schmitt has entered the electrical distribution department of the Montreal Light, Heat & Power Company. Mr. Schmitt had previously for ten years been connected with the Montreal company, but for the past eight years was engaged in distribution and high-tension line work with the Cleveland Electric Illuminating Company and the Pennsylvania-Ohio Power & Light Company at Youngstown, Ohio.

Norman M. Albert, who was identified with the General Electric Company, Schenectady, N. Y., is now research engineer, bureau of tests and inspections, of the Pacific Gas & Electric Company, San Francisco.

V. P. McNamara, who has been connected with the Puget Sound Power & Light Company at Bellingham, Wash., for several years, has been named as manager of the Edmonds office of the Washington Coast Utilities, succeeding E. M. Moore. The Washington Coast Utilities is a subsidiary of the Puget Sound company. Before his association

with the Bellingham office of this company Mr. McNamara was connected with its Olympia office.

H. C. Cummins a Byllesby Vice-President

Henry C. Cummins, who has been recently appointed vice-president of H. M. Byllesby & Company, has been associated with the Byllesby interests continuously since his graduation from Chicago University in 1910 with the exception of a brief period spent in military service. After leaving college he joined the operating department of the Byllesby company, spending some time in the Willamette Valley in the construction, engineering and operating departments of what was known then as the Oregon Power Company (now the Mountain States Power Company). Subsequently he affiliated himself with the Northern States Power Company and from 1911 to 1917 was connected with the Faribault, (Minn.) and Stillwater (Minn.) divisions of this company. When he left to enter the army he was assistant manager of the entire group of Northern States properties, with headquarters at Minneapolis. Upon returning from military service he rejoined the Byllesby forces, acting for the board of directors of H. M. Byllesby & Company as special representative of the company's petroleum interests. In 1919 he became affiliated with the Shaffer Oil & Refining Company at the time that organization was acquired by the Byllesby interests, being elected vice-president and secretary of that company in 1921 and president in 1922. This position he occupied until his recent election to the vice-presidency of the Byllesby company. Mr. Cummins is a native of Media, Pa.

M. N. Webster, formerly connected with the Leavenworth division of the Kansas Electric Power Company, has been appointed commercial manager of the company at Bonner Springs.

Ralph Pittman, who has been superintendent for the Pine Bluff (Ark.) Company, has been made electrical engineer for the Arkansas Light & Power Company and is now directing construction.

Arthur L. Abbott has just been appointed technical director of the Association of Electragists International—a new office in that organization from which important results are expected. Mr. Abbott headed the committee to prepare the estimating manual of the association. He is known as the father of the Abbott system of electrical estimating. His first cost data work was done in 1919 at the instance of the Minnesota State Association of Contractors. More recently he was chairman of the cost data committee of the national association. About a year ago he became sales manager for the Frank Adam Electric Company of St. Louis, and previous to that connection he was the manager of the Electric Construction Company, now the Commonwealth Electric Company, of St. Paul. His work in his new post at the headquarters of the association in New York will include the preparation of cost data, investigating labor costs and preparing additional sections of the manual of estimating. He will begin immediately an investigation of residence wiring with flexible steel-armored conductor, in addition to taking charge of all technical correspondence.

H. H. Allison, illumination sales engineer of the Pacific Gas & Electric Company, San Francisco, has resigned to associate himself with the National Lamp Works of the General Electric Company, Oakland, Cal.

Fred C. Hard, formerly industrial heating engineer in the sales department of the Edison Electric Illuminating Company of Boston, has joined the electrical contracting house of G. E. Bliss, Inc., Boston and Malden, as power engineer.

C. A. Larson, formerly connected with the Public Service Company of Colorado, has been transferred to the St. Joseph (Mo.) Heat, Railway, Light & Power Company. Both these utilities are Doherty properties.

W. L. Robbins, who has been connected as engineer with the Tacoma (Wash.) properties of Stone & Webster, has been transferred to the Puget Sound Power & Light Company, Seattle, where he is assistant to the chief electrical engineer.

Guy W. Thaxton has resigned as assistant professor of electrical engineering at the Georgia School of Technology to become associated with the central-station division of the Westinghouse Electric & Manufacturing Company, Atlanta.

Charles A. Kane, treasurer of the Atlantic Insulated Wire & Cable Company, Stamford, Conn., has been elected secretary of the New England Division of the National Electrical Credit Association and of the New England Electric Credit Club, succeeding James A. Loring. Headquarters will be in Boston.

Fred L. Mowry has been appointed commissioner of the municipal electric light plant at Cleveland, succeeding C. G. Beckwith, transferred to his old post as superintendent at the power plant. Mr. Beckwith has been performing the dual duties of commissioner and plant superintendent. Mr. Mowry, a native of South Walpole, Mass., has been engaged nearly all his life in power and traction work.

R. S. Hyatt, formerly engineer and manager of the Cornell Hydro-Electric Company, Valentine, Neb., is now superintendent at Fullerton, St. Edward, Belgrade and Genoa, Neb., for the Nebraska Gas & Electric Company, succeeding E. E. Dunder, who is now engaged in construction work for the company.

John F. De Bolt, formerly connected with the West Penn Power Company, is now superintendent of construction for the Fairmont Electric Service Company, engineer and contractor, Fairmont, W. Va.

David D. Gibson, Jr., who has been serving as field engineer on the Springdale power station for Sanderson & Porter, engineers, has affiliated himself with the Dixie Construction Company of Birmingham. Mr. Gibson will take up his new duties there on June 1.

A. S. Cummins Vice-President of Standard Gas & Electric

Albert S. Cummins, recently appointed vice-president of the Standard Gas & Electric Company and the Northern States Power Company, has been associated with the Byllesby interests since August, 1914, when he entered the operating department of the Northern States Power Company at Minneapolis. Subsequently he was transferred to Stillwater, Minn., where he became manager. In the early part of 1917 Mr. Cummins went to New York as vice-president of the Caribbean & Southern Steamship Line, a subsidiary of H. M. Byllesby & Company, severing his connection later to enter military service. Since March 1, 1919, he has been connected with the bond department of H. M. Byllesby & Company. Frequently Mr. Cummins' work has taken him to the properties operated by the company to launch campaigns for the local sale of securities. These customer-ownership campaigns have brought him in intimate touch with the Standard Gas & Electric Company properties in seventeen states.

J. W. Carey has been made chief engineer of the State Department of Public Works at Olympia, Wash., succeeding Herbert J. Flagg, resigned.

Harry E. Carver, appraisal engineer for the New Jersey Board of Public Utility Commissioners, with office at Newark, resigned on May 1.

J. Lane Polk, Jr., has been made assistant transmission-line engineer with the Pennsylvania Power & Light Company, Allentown, Pa.

John S. Hogan of the Northern States Power Company has been elected president of the newly organized Electrical Board of Trade of Minneapolis.

Frank E. Layman, manager of the molded-products department of the Cutler-Hammer Manufacturing Company, Milwaukee, has resigned.

R. A. Conaway, formerly assistant engineer with the Georgia Railway & Power Company, Atlanta, has been made distribution engineer.

R. H. Skill, manager of the Pacific Power & Light Company at Pomeroy, Wash., has been appointed district manager of the Dayton-Waitsburg district, Wash.

Bayard W. Robertson has been appointed assistant superintendent of the advertising department of the bureau of public relations of the Edison Electric Illuminating Company of Boston.

Alexander A. Leeven, formerly connected with the New York Edison Company, is now identified with the Electric Bond & Share Company in the capacity of electrical designer.

J. H. McCombs, formerly distribution engineer with the Georgia Railway & Power Company, Atlanta, has been appointed assistant superintendent of distribution.

F. L. Maytag, chairman of the board of directors of the Maytag Company, Newton, Iowa, manufacturer of washing machines, has been appointed by Governor Kendall as director of the budget for the state of Iowa.

Commission Rulings

Commission's Duty to Protect Investors. — In passing upon security issues of the Mobile Gas Company the Alabama Public Service Commission took occasion to condemn overcapitalization. "We know," the commission said, "that it is common for the utilities and their bond brokers in issuing circulars to the public and in advertising such bonds to recite in such advertisements that the bond issue has been approved by this commission. It is very plain, therefore, that the commission owes a duty in this matter to the investing public. In fact, statutes similar to those under which we here act have been construed by the Supreme Court of Michigan as having been made for the 'plain purpose of protecting investors against the evils of overcapitalization.' We think this is one purpose of the statute, but not its only purpose. In our judgment, it was enacted also for the purpose of requiring public utilities, which in their very nature contemplate long, continued operation, to exercise the highest care in building their financial structure and also for the purpose of protecting both the utilities and the public from the disasters which sooner or later will overtake every business that is overcapitalized. . . . Under the law of this state it is not compatible with the public interest that the outstanding stock and bonds of a public utility should exceed the fair value of its property."

Utilities Ordered to Make Unremunerative Investments Must Be Allowed to Increase Rates.—In ordering the Berlin Water Company to extend its service to fifty families living on a high plateau on the outskirts of the city, the New Hampshire Public Service Commission said: "There is a popular impression that it is the duty of a public utility to furnish service to any one desiring it who lives within the territory where the utility has a franchise to operate. This is true only when furnishing such service will not work a hardship on those already served. If the revenue to be derived from this service will not be sufficient to pay a reasonable return on the investment, and there is no prospect that it will do so in the future, it is only fair that those for whose benefit the investment is made should be required to contribute something toward the capital expenditure or pay a higher rate than other patrons in order that the utility may obtain reasonable compensation for the service rendered. Otherwise the rates to all consumers, including those in no way benefited by the extensions to the plant, will have to be increased. . . . If the commission orders a company to furnish service, it cannot consistently say in the future that it was an error of judgment on the part of the company to make the necessary investment. In other words, the Berlin Water Company can rest at ease as to the future if this petition is granted, well knowing that the commission will be tacitly committed to the proposition that the company may charge a rate adequate to pay a reasonable return upon this additional capital investment."

Where the Law Has Prescribed No System of Wiring, Owner of House May Follow Any Method Compatible with the Rights of Others.—It has been held by the Vermont Public Service Commission, in adjusting a complaint made against the Vermont Hydro-Electric Corporation, that in the absence of legislation governing the installation of wiring and in the failure of the commission to fix a standard system—assuming that that power had been conferred upon it—an electric utility company could not require a particular kind of installation as a preliminary to rendering service, its power extending only to rules and regulations affecting rates. Standing upon his constitutional rights, an applicant for service might adopt any system of wiring, however eccentric, for his house so long as the rights of others were respected and no law was violated, and objection to his plan of wiring could not be made the cause of a refusal of service.

Recent Court Decisions

Promise Made by Power Company to Railroad Did Not Impose Liability to Employee of Railroad.—In Mirnek vs. West Penn Power Company suit for damages was brought because of a fatal accident to an employee of a railroad company who came into contact with the high-tension wires of the power company paralleling the track and furnishing electricity to the railroad. The tracks were being raised, and the defendant company had promised to raise its wires correspondingly, but had not yet done so, a condition thus existing that brought about the fatality. The Supreme Court of Pennsylvania affirmed judgment for the defendant company, maintaining that it owed no duty to the railroad's employee, since if the latter knew of the promise to raise the wires he must have known the danger and have chosen to take the risk, whereas if he did not know of the promise he could not have relied on it. The power company, the court held, was not bound to anticipate that the railroad company would so elevate its tracks as to make the wires, which were properly installed, dangerous to its employees; nor did the fact of a previous accident of a less serious kind, reported to the power company and which led to its promise, alter its freedom from liability for the death of the railroad's employee. (123 At. 769.)*

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Duty of Electric Company to Warn Invitees of Danger.—Answering a question certified to it in Reinle vs. Galveston-Houston Electric Railway, a damage suit arising from a fatal accident, the Supreme Court of Texas, premising that it is the duty of one inviting another to come on his premises to warn him of any danger that may be encountered, said further that where an electric railway company employed an independent contractor to construct a causeway which necessitated the use of a derrick near its uninsulated high-voltage electric wires, it was the duty of the company in the exercise of ordinary care to give an employee of the contractor warning of the danger of the derrick boom coming in contact with the uninsulated wires, notwithstanding that the contractor knew of the danger and was also liable. (258 S. W. 803.)

Finding of Commission as to Excessiveness of Rates Not Conclusive in Action to Recover Payments.—Marty vs. Kansas City Light & Power Company was an action by consumers to recover rates paid for steam heat during a certain period on the ground that such rates were excessively high and unjust. A finding of the Public Service Commission that the rates were excessive was declared by the Supreme Court of Missouri to be not conclusive because the order was made after a hearing in which the commission did not attempt to allocate or separate the values and operating expenses of the defendant between the uses for heating and electricity. A subsequent commission hearing had shown that the steam-heating department of the defendant was operated at a loss during the period in question, and its prior order was not a binding adjudication but merely prospective and made without prejudice as to what might thereafter be shown on fuller investigation. (259 S. W. 793.)

Owner of Water-Power Site Appropriated by State in the Interest of Navigation Is Entitled to Compensation.—Prior to 1910 the Waterford Electric Light, Heat & Power Company owned property on both banks of the Hudson River, including a water-power site at Van Schoenhoven Rapids, which was subsequently to that year appropriated by the state in the carrying out of projects in connection with the Barge Canal and the improvement of navigation on the upper stretches of the river. The company sued the state, claiming damages not only for the value of its upland property—a claim admitted by the state—but for the value of the water power as well. A judgment in favor of the plaintiff has been sustained by the Supreme Court of New York, Appellate Division, which held that, notwithstanding non-use of the water power by the company for ten years, it was entitled to compensation for its franchise and that the contention that this claim was invalid, since the object of the state was to build a dam to improve navigation, was without merit. The owner of a river bank, the court said, and not the owner of the river bed, owns the undeveloped power of a river waterfall. (203 N. Y. S. 858.)

Manufacturing and Markets

Devoted to the Discussion of Business and Economic Problems of the Producer and Distributor, with Market Reports, Trade Activities, Foreign and Construction News

The Used-Equipment Market

What It Involves and What It Offers to the User in Stocks Readily Available and in Service—The "Second-Hand" Stigma

By A. O. Kuehmsted
Sales Manager Gregory Electric Company, Chicago

THERE are two classes of buyers for used equipment. Primarily, the first class of buyer is one who has had a breakdown and must have something in a hurry. Here service is what is needed and price is of secondary importance. In this case the purchasing agent almost invariably thinks of the used-equipment dealer, because he knows from past experience that if his requirements can be met at all, an immediate delivery can be obtained. This matter of being able to furnish immediate service with many types and sizes of motors and generators carried in stock is a factor which dominates the entire used-equipment market. That is the basic reason why this service came into being.

The second class of buyers of used equipment—and by far the larger class—is made up of firms and individuals who are keen business men and who, when buying additional equipment, wait for their opportunity to pick up just what is needed. When a standard high-grade used machine can be obtained at a price affording a material saving over similar equipment purchased new and equally good service can be obtained from either, it seems to them economically unwise to buy the latter. The fact that a motor has been in operation before does not and should not condemn it in the eyes of the prospective purchaser.

The great mass of equipment offered by representative used-equipment dealers today, as a matter of fact, has not been taken out of service because of its being worn out or defective; but, on the contrary, it comes on the market either because it has been replaced by a larger machine or because local conditions have changed, as, for instance, by the replacement of direct-current equipment with alternating-current, or vice versa. Such machines as a rule are in perfect operative condition and need but few minor repairs.

The "Second-Hand" Stigma

Ever since man first traded and bartered commodities most things that were new have been held in greater esteem than things that were old. As trading went on a term sprang up to designate a commodity which had been soiled by the previous user. It was designated as "second-hand material" and was not considered desirable. Undoubtedly this feeling originated with trading in personal effects which did deteriorate with use. Other commodities, however, do not bear this stigma upon being resold. People live in houses previously occupied by some one else. They wear diamonds and pearls previously worn by others. They delight in displaying their rare antique Oriental rugs and furniture to admiring friends—and no one considers such articles as second-hand and inferior. They have an intrinsic worth that nothing can take away.

Industrial equipment likewise does not lose its value by an exchange. It does not become contaminated and should not be stigmatized as "second-hand" because of former use by some one else. Because it has given good service to the former user is no reason why electrical equipment should be considered less desirable than new equipment, the performance of which may well be uncertain until it is tried out. The terms "second-hand" and "used," therefore, are too loose to indicate the proper status of such equipment. The term "reconditioned" is far more fitting to equipment that has been properly overhauled, tested and is guaranteed to operate.

The chief source of objection in the past to "reconditioned" equipment has been the lack of understanding among purchasers as to what they could expect in the way of high-caliber material. True, there have been and still are many "second-hand" dealers who rightfully are so called because they function only as such and sell their wares "as is" and "subject to inspection" and "let the purchaser beware." But the legitimate "reconditioned" equipment dealer in the electrical industry does perform a service to his customers by keeping good stocks readily available and in such condition that good service is assured.

Basis of Price

The basis on which prices are determined in the sale of used equipment is naturally a matter of general interest. So many factors enter into the arranging of a price level to cover a line of equipment, however, that there can be no fixed rule. First of all, supply and the present economic demand count for considerable. For example, single-phase, two-phase and three-phase alternating-current electric motors are bought on a smaller discount from original cost than all other types—because a demand exists and a larger volume of business is possible on smaller margins. However, since there is keen competition between dealers of used equipment, it naturally is to their own advantage to keep their stocks as complete as their estimate of the market will allow.

There are many hazards, however. A new line of apparatus may completely depreciate the value of the type of equipment now in use, so that an entirely new place must be found for it. The type of service rendered also affects the balance, that is, whether it is good for heavy duty with small enough maintenance cost to come under the price of new equipment on the market.

There is great opportunity for more practical co-operation between central-station managers and dealers.

In fact, the manufacturers themselves would do well to co-operate with the used-equipment dealer when they are contemplating changing over a town, say, from direct current to alternating current, by not leading their customers, the motor users, to expect too much for the old equipment. Frequently this is sold in one lot to the dealer who is the highest bidder. But in making his bid the dealer must buy everything low enough to be able to sell the desirable stuff after it has been reconditioned at a price sufficiently below the present selling cost of a similar machine new to warrant the purchaser in buying it. For the dealers' selling price is always fixed largely by competition. It always has to be considerably below the cost of the equivalent article new.

The Dealers' Offer Explained

In buying large lots many pieces are received that never again can be offered for sale. They are junked, and the rest must be priced with that in view. Many seemingly quite desirable machines are also junked. We have found through sad experience that while many of the older types can be repaired and re-conditioned to satisfy the most exacting customer, the cost of making these needed repairs is sometimes excessive and there is no profit in attempting to repair them. If, therefore, at times the offers of a dealer on a certain type of machine seem surprisingly low, the inside truth is probably that he does not intend to recondition the machine and offer it for sale again. It is intended for the scrap heap.

The Service Element

Buyers of reconditioned equipment also often fail to reckon the cost of the service voluntarily offered by the well-established used-equipment dealers in furnishing consulting engineering service and helping their customers select the proper equipment. Although this is an additional expense, the service is freely given and purchasers should take advantage of it. In many cases it is necessary for us to recheck the use of certain equipment that a purchaser thinks he needs because of his lack of engineering information regarding the use to which he is placing it. By so doing we have often been able to help improve his power factor, which is so often lowered by overmotoring.

In short, the used electrical machinery dealer is well-established as a business man, and the purchaser can well afford to shop around a bit and look this market over before actually placing his orders for new equipment. Oftentimes he will be able to obtain better deliveries at a lower price with engineering service of as high a character as that offered by the manufacturers.

Business Conditions

A Survey of Important Developments in the Electrical Market Including Data on Production, the Sales Outlook, Credits, Exports, the Metals and Other Conditions Affecting Cost, Supply and Demand

THE electrical business continues to hold up well throughout the country and sales are reported in good volume. The passing of the bonus and tax bills, however, has had a very unsettling effect, and several prominent executives of the electrical industry have publicly expressed their fear of the consequences if Congress, in spite of the urging of the President, continues to show what they think a disregard of public interest and economic law. This situation increases the uncertainty and hesitation of all markets.

But the week has brought a cheerful note in the placing of an order of more than a million dollars for the electrification of a large steel mill, as well as another large order from the glass industry for similar work. Bids were asked also for eighty electrically operated railroad cars.

Trade in New England is reported in moderate volume with central-station buying still the biggest factor. A slight improvement has been noticed in the New York district as the month progressed. Industrial apparatus, particularly motors, are slow, but transformers are in good demand. In the Southeast district good business holds, although there has been a slight falling off. Transformers, high-tension equipment and appliances, especially washing machines, are very active there. Some improvement is shown in the Middle West, and large purchases of tungsten lamps by central-station companies were reported, while building construction continues at a high rate. On the Pacific Coast business has held up well and, although the quantity seems to be decreasing, industrial purchasing, is actually supplying the bulk of the orders for electrical staples.

Identified Terminals of Wiring Devices Not Yet Required by Code

THE 1923 National Electrical Code contains no rule which recommends that wiring devices should have identified terminals, although apparently there has been some misunderstanding about it. The electrical committee of the National Fire Protection Association has issued a statement that the subject of identification of terminals was considered by it in the preparation of the 1923 edition, but no rules or requirements were adopted, and that it was not and is not now the intention of the committee that any rules in this edition should require such identification or be interpreted to do so.

The matter is said to be still in the hands of a special technical sub-committee which is expected to report later, with recommendations for a future edition of the code, when it shall have considered all phases of the matter, among which are the form of markings, which devices do and which do not require such identification, the necessary time required to permit compliance with new rules, if adopted, etc. While some manufacturers of wiring devices have already begun the production of devices with identified terminals, the practice has not yet become general either with all makers or on complete lines of devices.

There are now large quantities of devices without identified terminals in the stocks of manufacturers, jobbers and others for the disposition of which reasonable time should be allowed. For these reasons the electrical committee judged it inadvisable to include requirements of identified terminals in the 1923 edition. The subject is receiving further careful consideration by the committee and by the manufacturers in anticipation of possible action at a future date.

Brisk Demand for Electrical Instruments for Special Applications

MANUFACTURERS report the demand for electrical instruments as a whole, considering all the different applications, as being normal, with a very good demand for their products for specialized service as in X-ray apparatus, farm-lighting plants, etc. The automotive industry is also absorbing a heavy output of instruments for panel service on cars and trucks, one maker having a present shipping schedule of twenty-five thousand per month to a single motor-car manufacturer. There is also an active sale of instruments of the small portable type for garage use. There has been a vigorous demand for high-grade small voltmeters and ammeters for radio use, and although sales have now slackened up somewhat, they are expected to show a greater increase later in the year.

There has been a strong interest apparent in precision instruments for cable testing, electrolytic and insulation research. The growth of the radio business has been one of the chief factors in the good sales records shown by instrument manufacturers for the past year. The total sales of two prominent houses were 50 per cent greater for the first quarter in 1924 than for corresponding period in 1923.

As far as future sales are concerned it is expected that there will be a gen-

eral let-down during the summer, but the demand should come back again in the early fall. The outlook is very attractive for those companies that have a penchant for the commercial development of high-grade apparatus for use in engineering and research laboratory investigations.

Manufacturers are finding it easy to obtain plenty of raw materials and parts for fabrication into these delicate products. Such items as jewels and metal dials are not quite so easy to obtain and are the limiting factors in deliveries. Labor conditions are good. Deliveries are very prompt unless special instruments are involved. Many orders are shipped from stock, a fair percentage in about two to three weeks and a smaller percentage in from three to four weeks. Prices have been remarkably steady for some time, and there is little indication of an early change. In general, such price changes as may be made have for their reason the necessity of meeting competition.

Quiet Week in Non-Ferrous Metal Market—Copper Inquiries Increasing

THE week has been very quiet in the non-ferrous metal market. Copper producers do not seem inclined to go below current price levels in an effort to force sales. Inquiries, however, have picked up in the last day or two.

Lead remains substantially unchanged in price since the American Smelting & Refining Company's reduction to 7 cents on May 22. Some sellers have been shading the A. S. & R. price a few points, so that the metal was obtainable in fair quantities at 6.90 cents (New York). The general consumption of lead continues good.

Tin appears to be slightly stronger

NEW YORK METAL MARKET PRICES

	May 21, 1924 Cents per Pound	May 28, 1924 Cents per Pound
Copper, electrolytic	12⅞—12¾	12⅞
Lead, Am. S. & R. price	7.25	7.00
Antimony	8⅛	8⅛
Nickel, ingot	27	27
Zinc, spot	6.05	6.20
Tin, straits	41½	42
Aluminum, 98 to 99 per cent	28	28

(Original data supplied by the Bureau

Principal Exports of Generators, Wire, Electrical Glassware, Globes, and

	Globes and Shades for Lighting Fixtures	Electrical Glassware Except for Lighting	Electrical Porcelain	Carbons, Brushes and Electrodes		Insulated Iron and Steel Wire		Other Manufactures of Aluminum		Copper Wire (Bare)		Insulated Copper Wire and Cable	
	Dollars	Dollars	Dollars	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars
1 Belgium	505	12	1,145	274,502	55,566	157,429	46,494	1,293	764	18,340	4,210	2,889	2,840
2 Denmark	259	.....	.....	45,186	2,370	.....	.....	66	89	2,865	1,190	11,572	6,617
3 France	556	3,051	207,555	195,844	35,730	63,260	26,113	5,845	5,501	14,030	12,899	137,838	92,826
4 Germany	.....	83	.....	281,765	57,695	.....	.....	535	190	.....	.....	67	25
5 Italy	842	.....	129,350	2,853,316	540,603	986	476	12	12	5,046	1,644	17,069	16,908
6 Netherlands	266	.....	1,320	34,949	6,791	.....	.....	791	530	74,568	12,223	1,655	5,264
7 Norway	48	.....	20,793	561,618	50,125	56,672	7,983	190,795	35,660	9,287	1,935	122,878	26,134
8 Portugal	.....	.....	11,315	359	351	150	77	15	9	9,274	1,608	622	213
9 Spain	626	1,548	205,766	126,427	22,006	1,577	291	464,691	109,361	231,220	48,250	84,426	21,347
10 Sweden	38	.....	23,840	219,155	30,591	.....	.....	3,299	1,670	470	255	160	158
11 Switzerland	.....	.....	2,422	68,339	13,341	2,147	521	.....	.....	1,083	385	.....	.....
12 England	56,457	17,548	25,153	1,428,187	290,063	23,787	13,713	208,875	83,622	704,526	173,984	484,790	274,335
13 Scotland	257	.....	.....	68,564	15,048	2,082	1,168	28	20	.....	.....	.....	.....
Canada:													
14 Maritime Provinces	2,747	2,227	2,582	221	113	4,326	1,840	4,946	3,719	17,967	2,717	18,033	4,353
15 Quebec and Ontario	123,647	70,150	358,908	22,481,631	836,864	32,866	11,240	641,466	297,423	581,575	126,560	768,463	379,267
16 Prairie Provinces	10,783	8,357	14,479	144,244	16,704	11,242	3,523	21,178	14,354	22,823	3,820	17,681	11,216
17 British Columbia and Yukon	7,880	9,008	18,672	5,763	1,622	2,529	706	7,750	3,947	16,578	4,101	58,993	9,231
18 Costa Rica	1,505	319	2,576	2,856	1,066	27,365	9,070	550	886	44,077	5,270	48,400	12,290
19 Guatemala	964	93	8,889	36,533	1,648	13,256	1,824	190	242	40,549	7,560	126,764	28,345
20 Honduras	1,836	517	4,117	441	317	9,196	1,873	1,285	1,460	84,801	17,427	64,862	16,714
21 Nicaragua	178	1,737	1,128	79	137	2,690	490	724	535	82,886	15,504	21,644	5,546
22 Panama	3,199	573	4,632	1,955	1,159	25,830	3,161	3,120	2,122	25,743	5,582	50,521	15,093
23 Salvador	337	966	1,156	1,489	713	17,558	2,874	267	274	14,753	3,082	57,243	13,104
24 Mexico	44,300	11,814	67,512	101,059	31,182	477,284	94,653	384,005	89,993	680,107	147,069	1,874,895	413,815
25 Newfoundland and Labrador	857	1,279	6,799	1,175	569	62,817	15,695	764	432	2,145	617	26,390	5,697
26 Bermuda	681	353	838	90	55	325	59	1,521	914	25,296	5,309	17,315	4,350
27 Barbados	243	66	22	501	93	3,536	950	13	17	.....	.....	919	564
28 Jamaica	1,303	524	1,919	1,939	858	17,481	2,834	344	486	36,457	7,706	22,418	5,621
29 Trinidad and Tobago	827	1,120	791	2,964	970	13,797	2,799	587	259	20,997	4,136	12,634	3,735
30 Other British W. I.	1,545	126	1,468	48	41	10,614	1,824	26	15	1,125	303	20,099	6,839
31 Cuba	45,087	15,501	98,905	46,846	15,284	539,065	121,955	28,019	21,866	2,155,271	426,378	2,165,469	502,280
32 Dominican Republic	2,268	723	4,866	311	180	7,629	1,741	565	344	7,688	2,077	40,174	10,622
33 Haiti	521	838	499	119	140	11,729	2,486	333	368	37,507	7,981	46,900	7,849
34 Argentina	5,854	1,530	5,060	26,606	6,870	50,763	13,338	119,325	69,808	1,007,450	200,379	761,609	169,971
35 Bolivia	.....	49	1,959	.....	.....	2,383	760	261	117	3,118	878	13,685	3,592
36 Brazil	15,186	5,807	92,293	233,024	50,215	74,504	17,705	1,180,583	259,202	797,535	148,158	1,326,942	306,159
37 Chile	4,810	1,544	29,036	52,997	31,413	74,921	18,669	229,241	54,104	696,311	125,538	487,378	121,015
38 Colombia	3,695	2,684	19,041	5,202	2,109	107,558	19,743	3,658	2,838	359,864	56,944	238,840	65,766
39 Ecuador	1,087	736	484	944	344	6,365	1,346	7,635	1,544	16,456	4,487	32,411	7,429
40 British Guiana	773	88	1,052	836	821	1,812	525	357	220	5,653	1,211	6,671	2,096
41 Peru	4,417	1,982	17,702	2,194	2,195	48,794	12,279	938	1,254	355,035	72,245	330,086	69,088
42 Uruguay	1,630	210	817	549	331	63,678	15,970	9,029	5,897	13,683	3,938	43,272	12,989
43 Venezuela	1,519	1,495	3,757	6,309	2,715	26,224	5,521	2,503	1,280	46,784	9,537	150,939	44,484
44 British India	5,317	116	38,254	22,105	5,526	34,165	7,664	1,074	788	226,276	40,612	83,338	24,294
45 China	6,399	485	6,410	39,281	9,390	173,848	35,775	19,936	8,633	29,384	6,280	233,384	59,287
46 Java and Madura	118	.....	18,595	357	177	395	490	132	83	495,257	83,792	223	119
47 Other Dutch East Indies	180	.....	6,649	2,763	1,195	.....	.....	140	86	388,263	64,353	7,295	2,333
48 Hongkong	1,986	161	63	10,025	2,410	80,137	2,280	5,608	2,840	30,117	5,150	35,884	6,887
49 Japan	7,088	1,249	52,379	257,676	68,273	637,958	94,689	193,386	44,389	24,093	4,116	1,043,288	168,115
50 Kwangtung, leased terr.	39	.....	580	1,908	629	.....	.....	7	16	.....	.....	36,294	7,453
51 Palestine and Syria	400	.....	.....	.....	.....	.....	.....	10	32	.....	.....	88	39
52 Philippine Islands	9,158	4,392	10,165	39,625	7,831	153,815	36,006	4,646	3,724	323,024	71,958	284,599	71,929
53 Australia	63,428	10,016	81,465	268,153	45,133	39,497	13,027	53,550	23,599	24,158	9,559	83,107	34,221
54 New Zealand	7,985	1,194	162,971	24,331	5,026	30,771	2,346	10,068	5,385	20,400	5,334	44,087	27,473
55 British South Africa	10,177	148	554	174,784	32,710	32,360	7,551	2,395	2,420	356	231	52,755	15,467
Total value in dollars for ALL COUNTRIES	$468,114	$184,276	$1,783,545	.....	$2,317,495	.....	$686,613	.....	$1,167,098	.....	$1,971,810	.....	$3,140,098

*Section II appears on pages 1160 and 1161. Sections III and IV will follow in an early issue.

than last week, but no rise of importance is likely to occur. There is no disposition on the part of consumers to purchase requirements ahead. Zinc has been stronger in the past two days owing to advances abroad, but domestic buyers are not anxious purchasers and the market is quiet. Current prices are so low as to produce little or no profit for the smelters.

Improvement Noted in New York District

THERE is a good volume of business being transacted in the New York district, a slight improvement if anything being shown as the month progresses. Industrial apparatus, particularly motors, is moving very slowly, while central-station distribution equipment remains in good demand. Transformer manufacturers report many inquiries and good sales are being made. The recent action of Congress on the bonus and tax bills is being very unfavorably criticised by manufacturers.

No particular demand is noted by jobbers in any lines except in one or two instances. In one case ventilating fans are reported as moving exceptionally well, while in another case candle pull sockets for the fixture trade are enjoying very good sales. Appliances are not moving very actively. More than one manufacturer reduced rubber-covered wire prices approximately 5 per cent on all sizes, with the exception of popular house-wiring sizes, in which the reduction was slightly less. Stocks are in good shape and jobbers are purchasing cautiously so as not to overload their shelves. Prices in general are maintaining their level.

New England Trade Reacts Slightly —Moderate Volume Transacted

ELECTRICAL material is moving in moderate volume in the New England district this week, central-station buying being the chief support of the market. Hand-to-mouth purchasing is very evident, and it is particularly noticeable that contractors are buying rather lightly. Sales of appliances have been very active, and much interest is being exhibited in street-lighting material. Fan sales are very dull on account of the cool weather, while electric heaters are showing fair

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of Foreign and Domestic Commerce)

hades for Lighting Fixtures, etc., from the United States during 1923—Section I*

Mechanical Drive Turbines		Direct Current Generators: Under 500 Kw.		Direct Current Generators: 500 Kw. and Over		Alternating Current Generators: Under 2,000 Kva.		Alternating Current Generators: 2,000 Kva. and Over		Accessories and parts for Generators		Self-Contained Lighting Outfits		
No.	Dollars	No.	Dollars	No.	Dollars	No.	Dollars	No.	Dollars	Pounds	Dollars	No.	Dollars	
		9	4,168	1	1,038	1	222			715	2,211	65	13,035	Belgium 1
		7	1,320							137	185	36	7,585	Denmark 2
1	3,105	2,439	62,286	7	97,885			2	74,930	13,940	9,162	19	6,652	France 3
		7	1,446											Germany 4
		7	517							11,741	8,654	11	2,460	Italy 5
		6	73			1	579			2,370	2,580	2	283	Netherlands 6
		6	3,483							2,143	789	3	884	Norway 7
										34,286	2,050			Portugal 8
1	195	14	2,428	5	31,097	2	300	1	19,254	9,482	4,717	56	24,575	Spain 9
		2	149			7	980			377	178	7	1,593	Sweden 10
														Switzerland 11
2	1,045	68	30,670	3	3,789	7	9,835	1	4,575	7,666	6,733	283	60,503	England 12
2	1,341	3	476											Scotland 13
														Canada:
3	4,448	18	2,237	1	600			1	2,134	8,181	4,142	2	725	Maritime Provinces 14
17	34,583	7,419	211,664	68	44,336	39	15,428			745,968	200,381	17	4,614	Quebec and Ontario 15
1	69	310	24,380	6	533	2	960			35,680	38,012	21	4,801	Prairie Provinces 16
														British Columbia and Yukon 17
2	970	91	14,670	1	102	3	553			5,595	4,094	4	1,582	
1	5,000	8	3,226							2,161	780			Costa Rica 18
1	7,705	15	6,727	2	6,786	1	928	1	7,600	19	76	11	3,606	Guatemala 19
		14	4,800	5	18,572	1	7,346	1	3,244	797	682	4	1,963	Honduras 20
		12	5,677			1	300			1,450	1,255	7	2,685	Nicaragua 21
		25	4,087							12,051	5,486	6	2,071	Panama 22
		16	8,493							1,962	811	25	8,392	Salvador 23
4	48,290	194	54,286	126	65,590	28	4,140	1	1,672	159,155	62,293	132	41,192	Mexico 24
1	736	3	1,046							460	519	1	424	Newfoundland and Labrador 25
		1	1,865											Bermuda 26
		1	38	1	697	2	1,548			241	265	5	2,340	Barbados 27
		11	4,854			7	1,74[illegible]			1,138	876	7	1,502	[illegible]maica 28
		15	6,790			1	175			1,235	772	10	2,388	Trinidad and Tobago 29
		20	2,519	3	13,455			1	28,414			5	1,553	Other British W. I. 30
15	34,666	83	33,060	5	128,258	37	10,595	2	22,010	285,342	78,345	184	49,340	Cuba 31
		7	463							732	1,056	14	7,040	Dominican Republic 32
		3	7,280							22	34	1	260	Haiti 33
3	18,033	50	10,074	5	28,101	11	7,565	1	6,405	108,824	110,835	210	61,538	Argentina 34
1	24,560	13	17,636	2	14,255	1	150			10,672	3,643	1	150	Bolivia 35
1	3,670	92	25,018	6	28,857	3	6,866	3	44,447	291,674	84,864	29	12,052	Brazil 36
		12	8,943	3	12,163	5	1,074			31,043	19,325	1	330	Chile 37
2	30,464	57	26,011			9	10,897			6,315	6,684	40	14,033	Colombia 38
		1	756	2	2,090	1	221			1,145	869	4	2,358	Ecuador 39
		2	1,362	1	16,209					630	620	6	2,395	British Guiana 40
3	3,746	49	13,863			8	3,110	1	6,021	11,939	7,996	19	4,861	Peru 41
		13	1,575							24,389	10,927	82	13,903	Uruguay 42
		49	13,690			1	975			1,839	2,157	37	8,906	Venezuela 43
		20	4,345			1	268	4	123,825	57,529	26,252	5	1,592	British India 44
		51	20,739	1	22,956	2	411	2	94,520	20,507	7,239	27	9,244	China 45
		7	776			12	16,374			10	11			Java and Madura 46
		21	6,713	1	2,105					15,345	3,979			Other Dutch East Indies 47
		4	172			3	1,250			5,293	891	2	1,000	Hongkong 48
20	287,519	118	37,542	19	162,842	16	12,090	37	816,910	1,044,654	268,890	3	766	Japan 49
		2	176	3	600					200	1,458	1	200	Kwangtung, leased terr. 50
		5	2,478							756	538	24	7,669	Palestine and Syria 51
2	1,937	34	8,702	2	29,900	2	3,582	1	8,700	6,403	5,327	6	1,348	Philippine Islands 52
		175	31,401	3	9,370	11	3,632			11,771	8,324	588	141,930	Australia 53
		38	15,428	5	20,434	7	1,000	1	19,386	2,788	2,205	9	1,350	New Zealand 54
		50	8,636							21,076	10,182	137	38,437	British South Africa 55
	$512,082		$778,963		$764,024		$127,845		$1,284,047		$1,025,218		$610,017	Total value in dollars for ALL COUNTRIES

sales in small quantities. Motors are in fair demand for industrial betterment.

Prices have weakened in all grades of wire, and competition is very close. Reflector prices have also been reduced somewhat. Outside of these exceptions the market is generally considered stable. Competition is very keen in all branches of the industry. The passing of the bonus bill has been very unfavorably commented upon by the trade, and some reaction was noticeable.

Good Business Holds Up in Southeast District

BUSINESS throughout the Southeast is showing signs of the general slackening reported from other sections, but as yet the shrinkage, except in isolated cases, is only small and the general outlook indicates that it will remain so. In Louisiana there is some reduction among the industrials, and while building activities are only fair, the retail electrical business is holding up well. Purchasing by the coal and iron industry in and about Birmingham continues firm, with the coal industry exhibiting the usual seasonal tendency. Building construction in Memphis is booming, work having recently been started on a new five-million-dollar hotel. This activity is being reflected in the excellent movement of electrical construction materials. Retail business is good in the entire section.

Textile mills generally are inclined to be somewhat pessimistic, with some scattered mills shut down and some others on part-time operation. The more aggressive mills expect the situation to improve materially within the next sixty days.

Orders and inquiries for high-tension transformers, of from 11,000 volts to 44,000 volts, from Southeastern power companies are reported quite satisfactory, while other high-tension equipment is also moving actively. Appliances are generally in good demand, with washing machines showing promise of more activity for the first time in several years as the result of strenuous sales campaigns put on by central-station companies. One company with ten thousand residential customers disposed of 150 washing machines during its April campaign.

Middle West Electrical Trade Showing Improvement

GENERAL business in electrical trade circles in the Middle West territory was on a little better basis this week. While trade as a whole is

(Original Data Supplied by the Bureau

Principal Exports of Railway Signaling Apparatus, Magnetos, Insulating Material, Wiring

	Other Telephone Switchboards		Railway Signaling Apparatus, etc.		Bells Annunciators, and Alarms		Spark Plugs, Magnetos, etc.		Insulating Material		Metal Conduit, Outlet and Switchboxes		Sockets and Lighting Switches	
	No.	Dollars	Pounds	Dollars	No.	Dollars	Pounds	Dollars	Pounds	Dollars	Pounds	Dollars	No.	Dollars
1 Belgium					115	585	18,258	28,106	13,068	6,011	804	119	146,190	35,086
2 Denmark							12,783	16,131	2,806	1,800	306	99	13,605	2,790
3 France			9,758	10,574	612	1,905	192,641	230,081	222,806	60,277	294	69	13,007	5,573
4 Germany							185	328	12,194	2,447				
5 Italy			1,481	1,838			15,685	25,797	46,356	11,233	46,099	11,633	2,269	896
6 Netherlands			20,746	14,264	16	109	11,204	14,624	11,431	3,612	829	189	46,928	12,272
7 Norway			25,290	7,229	1,084	191	4,901	6,626	24,995	4,496	13,110	787	35,329	14,863
8 Russia in Europe							1,556	2,132	177	316				
9 Spain	5	2,470	156,878	87,425	11	241	27,535	37,322	127,212	16,694	31,056	1,979	92,357	8,798
10 Sweden			1,562	2,097			23,357	27,955	28,738	17,427			2,592	362
11 Switzerland			226	157			4,690	6,061					15,370	6,596
12 England	2	1,224	22,203	18,675	8,588	4,532	50,135	49,126	570,040	341,999	72,817	4,256	189,668	72,526
13 Scotland					504	318	315	841	11,237	3,269	54	61		
Canada:														
14 Maritime Provinces	7	265	2,360	762	1,018	2,245	9,712	9,337	40,296	6,795	4,138	776	7,466	1,701
15 Quebec and Ontario	114	27,454	625,709	172,607	35,458	45,321	534,542	556,368	1,064,527	329,664	276,072	56,997	987,164	279,296
16 Prairie Provinces	1	57	84,470	16,553	1,374	2,592	35,855	43,957	79,322	10,591	7,218	1,167	82,714	12,408
17 British Columbia and Yukon	3	182	72,679	24,519	908	3,090	15,164	16,184	64,629	9,409	14,308	3,567	42,267	9,726
18 Costa Rica	1	435	245	85	6	3	396	441	7,971	2,780	1,825	321	8,454	2,506
19 Guatemala	3	1,201			88	95	531	850	12,967	3,707	27,757	2,768	10,165	2,272
20 Honduras	5	343	130	81	101	171	2,382	4,714	17,390	3,695	14,124	1,943	9,646	2,736
21 Nicaragua	2	726			62	115	1,529	2,005	1,211	501	381	410	6,044	1,222
22 Panama	1	75	155	92	151	216	13,576	10,733	16,532	3,211	28,339	3,134	12,830	3,522
23 Salvador	2	368			297	355	256	546	1,028	220	95	71	3,561	1,060
24 Mexico	44	11,295	37,477	7,372	3,593	3,221	20,616	28,678	133,944	44,416	689,914	55,411	267,763	50,925
25 Newfoundland & Labrador	1	416			180	67	8,644	2,442	28,065	3,170	6,424	696	4,197	1,275
26 Bermuda					1	17			527	160	18,740	3,171	3,244	678
27 Barbados			40	24			1,154	2,150	102	55	2,057	339	1,378	349
28 Jamaica	1	75	211	80	61	54	946	1,419	672	416	1,515	167	7,729	1,919
29 Trinidad and Tobago	2	100	192	149	494	212	1,706	3,081	2,385	431	5,077	523	4,671	1,646
30 Other British W. I.	2	58			76	95	410	787	6,423	793	7,608	1,135	7,598	696
31 Cuba	104	35,358	87,993	17,608	4,614	2,769	27,850	34,365	183,292	45,010	1,875,113	126,050	313,160	54,150
32 Dominican Republic	1	40	2,267	315	73	83	1,569	3,561	6,586	619	16,965	2,709	32,235	4,795
33 Haiti	2	364			104	155	125	145	552	385	8,613	643	2,486	483
34 Argentina			5,104	1,015	2,706	2,882	56,605	89,521	91,025	26,955	710,114	42,633	733,687	114,022
35 Bolivia					178	113	10	43	8,224	6,749	41,349	2,843	1,914	775
36 Brazil	1	250	12,641	3,800	1,293	1,460	10,866	15,816	111,369	36,965	463,591	33,123	296,285	56,955
37 Chile	9	5,016	18,524	4,035	1,680	2,392	7,389	11,980	311,086	63,289	259,075	21,465	54,003	13,491
38 Colombia	5	13,130			1,202	899	3,212	5,783	30,976	6,671	59,746	4,164	47,499	8,818
39 Ecuador	8	1,961			62	31	804	1,843	3,221	439	2,524	2,511	13,868	1,858
40 British Guiana	1	22	202	93	12	15	1,523	2,851	274	100	576	112	2,644	644
41 Peru	4	2,442	1,743	1,421	400	1,085	2,894	6,491	16,094	4,212	76,551	6,739	53,629	10,975
42 Uruguay			405	262			2,262	3,566	8,833	3,117	44,046	5,242	62,612	12,899
43 Venezuela	3	543			299	190	3,310	5,621	4,180	1,318	1,681	290	49,691	7,125
44 British India	10	1,012	6,964	3,936	4,482	3,125	7,865	12,228	37,821	9,311	234,682	18,152	5,488	1,866
45 Straits Settlements			150	120	2	49	14,045	22,795	272	118	169	120	1,200	171
46 China	3	583	6,625	7,030	4,123	2,144	3,287	5,560	73,796	7,266	127,260	10,391	76,599	14,940
47 Java and Madura							11,151	16,476	20,433	4,103	277	55	625	94
48 Other Dutch E. I.					325	651	1,457	3,045	2,492	465	15,972	1,242		2,448
49 Hongkong	3	1,239			41,902	6,966	5,484	3,595	2,255	389	18,088	1,699	6,134	33,446
50 Japan	2	8,940	590,182	184,839	1,404	609	78,136	116,759	607,706	240,920	489,940	45,321	87,838	540
51 Kwangtung, leased terr			30,979	9,670	1	50	96	89	289	168	4,202	227	1,200	54
52 Philippine Islands	2	3,805	12,478	2,194	1,314	3,067	17,345	26,571	17,927	4,695	76,578	6,313	157,741	30,264
53 Australia	463	281,468	231,610	112,014	13,874	10,352	108,138	92,581	276,715	55,682	3,817	707	362,327	123,216
54 New Zealand	3	2,476	19,025	20,121	1,733	2,296	43,882	23,928	35,951	10,993	6,912	1,135	94,710	34,069
55 British South Africa			330	182	176	283	6,425	11,858	32,436	13,182	2,591	694	37,685	8,166
56 Egypt							3,501	4,604	790	101	565	2,268	10,219	2,442
57 Portuguese E. Africa	6	6,200							843	435			800	1,176
Total value in dollars for ALL COUNTRIES		$412,249		$733,537		$107,466		$1,694,886		$1,435,410		$477,830		$1,077,225

* Section I appears on pages 1158 and 1159. Sections III and IV will follow in an early issue.

somewhat dull, the tone of the market has improved. Sales of high-tension equipment were good, one manufacturer receiving a sizable order. Central-station purchases have increased somewhat, those of particular note being for incandescent lamps, several having placed their orders for third-quarter requirements. One order for converters of considerable size was received this week by a manufacturer. Several large construction orders were also placed.

The jobbing trade reports better business with more inquiries for varied commodities received this week than last. Sales of fans began, although the extremely cold weather in this district retarded the usual volume of business. Building continues good, and prospects for better business appear in sight. This may be gaged from the increasing number of building permits taken out in the Chicago territory. For the third week in May, 1924, they totaled 449, with a valuation of $7,199,200, against 294, valued at $6,798,200, for the same period in 1923.

Business Holding Up Well on Pacific Coast

BUSINESS is still good on the Pacific Coast, although perceptibly decreasing, and it is apparent that the political uncertainty of the East is beginning to have an effect on the West, in addition to its own local conditions. Taking all things into consideration, however, business is considered as holding up well. Railroad and power utilities made few purchases during the week. Industrial purchasing is very good, though in decreasing quantities, and is actually supplying the bulk of the orders for electrical staples.

Dealers' business has been rather quiet. The number of telegraphic orders for short-time deliveries of conduit, loom, boxes, wire and other schedule material indicates the hand-to-mouth market that exists. A 10 per cent price reduction is reported on commercial-grade tapes and 10 per cent to 15 per cent decrease on lamp cords. Several good orders for rubber-covered wire were reported, and as there has been a decrease in bare copper wire, new prices are expected on weatherproof and rubber-covered wires. There is a fair demand for rural telephone sets, but, like every line which particularly concerns the farmer, a rather dull season is expected.

Collections are slower by about five days and are now averaging a little over fifty days. Credits are appreciably tighter, and a vigorous follow-up policy is being generally pursued.

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of Foreign and Domestic Commerce)

Supplies, Radio Apparatus, Telephones, etc., from the United States during 1923—Section II*

Other Wiring Supplies and Fixtures		Other Electrical Apparatus N.E.S.	Power Laundry Machines		Radio and Wireless Apparatus		Telegraph Apparatus		Magneto Telephones		Other Telephones		Magneto Switchboards		
Pounds	Dollars	Dollars	No.	Dollars	Pounds	Dollars	Pounds	Dollars	No.	Dollars	No.	Dollars	No.	Dollars	
3,685	3,758	74,082	1	90	3,395	17,672	277	1,156	2	72	1	17	2	288	Belgium 1
1,360	20,497	26,005	4	1,690	4,497	9,534	493	1,333			3	53			Denmark 2
12,466	15,776	256,894	50	27,810	19,921	57,487	2,392	3,676	13	82	60	355			France 3
		15,112	2	300	3,080	10,508									Germany 4
12,304	8,260	30,327	3	642	1,486	7,061			100	1,107	400	2,838			Italy 5
36,873	12,451	32,071	45	3,706	14,098	23,859	899	3,771			6	95			Netherlands 6
8,740	4,274	40,214	5	7,371	7,557	15,114	56	155			473	3,098			Norway 7
		14,486													Russia in Europe 8
63,956	17,882	129,988	7	1,120	4,315	9,702	2,864	1,500	30	611	11	362			Spain 9
3,591	2,732	29,855	59	12,771	521,937	458,886									Sweden 10
1,648	2,375	7,200	7	1,090	581	771									Switzerland 11
154,369	133,733	758,207	749	351,876	71,152	199,541	25,281	55,809	713	10,879	627	8,280			England 12
520	471	15,420	24	36,713	18	25									Scotland 13
															Canada:
17,460	7,808	80,118	75	7,775	8,928	14,964	78,223	18,451	225	2,494	108	1,207	1	800	Maritime Provinces 14
1,642,069	585,725	2,352,889	4,766	306,051	343,382	581,085	18,385	45,193	2,906	35,953	5,511	71,467	17	3,939	Quebec and Ontario 15
104,693	60,676	385,774	780	47,482	78,142	157,630	5,540	14,818	352	6,069	878	11,786	1	41	Prairie Provinces 16
															British Columbia and Yukon 17
62,255	25,806	129,914	580	46,234	24,119	40,996	3,721	6,813	8	60	54	1,046			
7,497	5,980	18,917	1	29	3,567	5,466	2,581	4,107	68	1,161	177	2,727			Costa Rica 18
16,349	10,509	11,432	5	574	2,471	3,449	41	118			4	330			Guatemala 19
30,100	12,704	77,559	4	597	1,772	8,662	610	923	90	1,381	139	3,520	5	1,756	Honduras 20
8,266	2,359	..077			1,664	1,824	274	435	35	502	51	786	4	57	Nicaragua 21
12,213	11,297	44,830	2	2,029	17,961	37,390	824	4,210			28	560			Panama 22
5,359	3,792	9,025			1,603	3,374	576	765	4	63	24	441			Salvador 23
321,757	118,458	360,099	47	6,847	169,413	281,275	32,493	11,410	476	7,981	767	10,497	8	896	Mexico 24
58,680	10,695	14,920	2	655	2,145	2,578	22,185	18,591			470	5,712	1	416	Newfoundland Labrador 25
60,519	34,410	22,214	24	19,883	1,961	2,853	395	870	8	103	99	1,080	1	290	Bermuda 26
1,999	752	4,516					108	47	66	1,178	6	48			Barbados 27
13,669	4,402	18,115	1	62	2,855	3,829	1,419	357	71	1,125	51	964	1	275	Jamaica 28
23,150	10,007	13,258	5	818	151	331	944	871	65	676	53	632			Trinidad and Tobago 29
20,681	12,306	9,151			2,202	1,683	79	97	58	1,040	135	2,121			Other British W. I. 30
435,532	178,893	519,198	41	19,593	115,659	212,288	9,557	19,898	3,185	41,611	2,596	34,195	11	4,083	Cuba 31
33,310	9,268	26,257	1	147	4,374	16,071			74	1,383	46	790			Dominican Republic 32
3,133	1,454	9,034	2	249	504	1,372			5	77	106	1,743	3	4,513	Haiti 33
131,595	64,842	151,108	10	4,273	274,495	646,993	114,279	362,450	369	3,752	170	1,585			Argentina 34
890	581	9,590			1,022	296			8	346	4	78			Bolivia 35
129,093	52,401	331,750	17	14,630	25,914	23,484	223	590	259	4,162	5,463	75,623	13	2,224	Brazil 36
95,024	33,901	284,005	1	370	24,561	51,000	6,581	5,997	129	5,170	71	1,888			Chile 37
41,438	17,264	70,045	6	663	2,620	2,730	1,706	7,786	1,154	13,960	631	8,400	8	2,743	Colombia 38
14,129	2,232	14,243			2,248	5,396	326	2,918	108	1,264	101	1,088			Ecuador 39
24,401	9,931	5,331	2	197	107	213	58	240	14	229	4	73			British Guiana 40
67,174	29,004	65,206	12	13,867	3,630	2,664	393	1,645	219	3,014	203	3,218	2	481	Peru 41
39,396	14,059	12,445	49	12,846	32,185	71,178	612	1,704	65	959	60	935			Uruguay 42
27,415	10,893	49,793	2	746	1,350	2,273	611	750	320	5,209	326	5,097	2	240	Venezuela 43
70,208	22,094	137,393	1	113	10,778	26,968	155	497	188	7,155	61	1,182			British India 44
3,868	2,506	8,320													Straits Settlements 45
29,595	21,209	176,391	14	4,606	11,101	20,656	147	665	444	6,280	27	514	6	1,772	China 46
863	1,486	27,433			2,019	1,784					450	10,147			Java and Madura 47
52,853	15,508	20,245													Other Dutch E. I. 48
7,860	3,790	17,501	4	1,050	14,608	14,385			72	1,321	92	544			Hongkong 49
95,330	52,154	835,470	38	6,037	22,165	45,761	26,743	66,620			34	596			Japan 50
83	76	8,30					3	12							Kwangtung, leased terr. 51
47,811	21,277	76,083	7	1,642	9,700	18,561	1,919	2,553	353	4,857	255	4,462	2	765	Philippine Islands 52
179,121	133,661	629,773	141	32,206	125,218	210,214	1,882	5,558	2,116	18,074	8,359	71,122	193	91,525	Australia 53
90,288	37,643	139,565	14	3,252	38,835	83,426	16	67	46	814	3,715	46,755	7	2,096	New Zealand 54
32,144	16,394	140,488	4	1,222	4,411	9,207	266	2,909	48	386	126	2,309			British South Africa 55
5,863	3,273	6,239			139	435									Egypt 56
209	69	6,517													Portuguese E. Africa 57
	$1,889,988	$8,818,011		$1,004,617		$3,445,563		$690,112		$193,630		$405,887		$119,100	

Activities of the Trade

Devoted to News of the
Manufacturer, Jobber, Agent, Contractor and Dealer, Including Important Orders and Contracts for Apparatus and Equipment

Westinghouse Receives Million-Dollar Steel-Mill Order

A contract totaling more than $1,000,000 has just been received by the Westinghouse Electric & Manufacturing Company for electrical equipment to be used in a new structural-steel mill of the Carnegie Steel Company now being erected in the Homestead (Pa.) group. Three of the steel company's steam-driven mills, located at Munhall, Pa., have been declared obsolete. They are being dismantled and replaced by two large electric mills. The contract given to Westinghouse represents the first half of this program.

The complete electrical equipment to be installed in the mill consists of the following: One 15,000-kw. turbo-generator, one 44-in. reversing blooming-mill equipment, consisting of one 15,000-hp. motor, flywheel motor-generator set and 5,000-hp. alternating-current motor; one 36-in. reversing intermediate mill equipment, consisting of one 10,000-hp. reversing motor and a flywheel motor-generator set, with a 3,750-hp. driving motor; a 28-32 in. three-stand finishing mill equipment, with a 6,000-hp. direct-connected continuous-running alternating-current motor, a 125,000-lb. flywheel and auxiliary apparatus. Each mill unit has also auxiliary equipment such as switchboards, control, etc.

Newport News Company Gets Turbine Contract for Muscle Shoals

The Newport News Shipbuilding & Dry Dock Company announces that it has been awarded a contract for the construction of four 35,000-hp. water turbines to be used on Wilson Dam, Muscle Shoals, Ala. The company also recently received an order for fifty-eight controlling gates for the same dam.

Line Material to Open Office and Warehouse at Syracuse

The Line Material Company, South Milwaukee, Wis., announces that on June 1 a new office and warehouse will be opened at 204 Burnett Avenue, Syracuse, N. Y., in charge of L. M. Greff, formerly of the New York City branch, assisted by C. A. Nichols. This warehouse will carry a complete stock of line material, and its central location in the state is intended to augment greatly its service to central stations in New York.

Post-Glover Electric Elects New Officers

The Post-Glover Electric Company, Cincinnati, jobbers and manufacturer of panelboards, switchboards, etc., at its recent annual meeting elected the following officers. F. D. Van Winkle, president; George N. De Vou, vice-president; E. L. Van Winkle, vice-president in charge of sales; M. T. Salling, vice-president in charge of warehouse and purchasing; P. B. Stanberry, secretary; E. B. Daulton, treasurer; Walter C. Macpherson, assistant sales manager; Edith M. Douglas, assistant secretary; Nan Hayes, assistant treasurer; E. E. Geldreich, auditor.

Roth Brothers Establishes New Distributors

Roth Brothers & Company, 1400 West Adams Street, Chicago, have recently given contracts to the following distributors, who are now selling Roth constant-potential chargers: Interstate Motor Equipment Company, Raleigh, N. C.; Spokane Battery & Ignition Company, Spokane, Wash.; Keiser-Van Leer Company, Bloomington, Ill.; American Bureau of Engineering, Chicago. The company further announces that after three years of operation not one Roth generator field or armature coil has burned out, because the coils have been subjected to a special insulating process during manufacture.

Rome Wire Disposing of Million Dollar Stock Issue

The Rome Wire Company, Rome, N. Y., is disposing of a preferred-stock issue of $1,000,000, a portion of the proceeds to be used for additional working capital for expansion. The company will remove the equipment at the plant of its subsidiary, the Atlantic Insulated Wire & Cable Company, Stamford, Conn., to the Rome works, for expansion at this point.

The necessary additions required at the Rome plant to accommodate the Atlantic company are now under way. The Atlantic equipment will be transferred to Rome during the coming summer.

The Electric Outlet Company, 8 West Fortieth Street, New York, is now manufacturing "wire-nuts," made of brass and bakelite, for use in making wire joints in outlet boxes and elsewhere. The wires are twisted together and the wire nuts screwed on in the usual manner. This takes the place of the soldering and taping operation which is ordinarily necessary in making a joint. "Wire-nuts" are approved by the Underwriters' Laboratories for this purpose.

The Jewell Electrical Instrument Company, Chicago, has published the first issue of what is to be known as the *Jewell Magnet*. The new house organ contains interesting matter concerning the activities of company men as well as information concerning the use of Jewell electrical instruments. According to the editor's announcement, the publication will be sent to friends and good customers of the company.

The Cutter Electric Company, Nineteenth and Hamilton Streets, Philadelphia, manufacturer of circuit breakers, has awarded a contract for the erection of a one-story building.

The Locke Insulator Company, Charles and Cromwell Streets, Baltimore, is continuing expansion at its local plant and has filed plans for the erection of a one-story addition, 80 ft. x 81 ft., estimated to cost $25,000, with equipment.

The Globe Electric Supply Company, Denver, has been appointed agent for Colorado, Utah and New Mexico by the Railway & Industrial Engineering Company, Greensburg, Pa., manufacturer of outdoor switching and protective equipment.

The Atlantic Electrical Supply Company, Baltimore, has acquired a two-story building at 109-11 Commerce Street for a consideration of $20,000 and will use it for general distributing and storage service.

The Berthold Electrical Manufacturing Company, 702 North Halsted Street, Chicago, manufacturer of washing machines and appliances, announces the appointment of Joseph V. Guilfoyle as general sales manager. For the last sixteen years Mr. Guilfoyle has been identified with the household electrical specialty field, having been for many years with several of the country's largest central stations. He has recently been sales manager of the Gainaday Electric Company and prior to that served on the selling staff of the United Electric Company, the Western Electric Company, the Apex Electrical Manufacturing Company and the Birtman Electric Company.

The Clipper Belt Lacer Company, Grand Rapids, Mich., has recently added a number of new articles to its line. The Clipper belt cutter is made in both open and closed-end models and will cut and square any make of belting with one stroke of the lever. The No. 1 lever lacer and the No. 1 vise lacer are especially adapted for use on belts not over $\frac{3}{16}$ in. thick nor wider than 2 in. The No. 0 baby belt lacer replaces the old No. 0 model and is used in connection with any ordinary vise for general belt-lacing work.

The Blumenthal-Kahn Electric Company, 505 North Eutaw Street, Baltimore, has leased property at 518 North Charles Street for a new works. The present building will be improved for early occupancy and a two-story addition erected for general production.

The Central Electric Company, Dime Bank Building, Detroit, is having plans drawn for the erection of a new five-story plant at Third and Antoinette Streets, 75 ft. x 200 ft., estimated to cost in excess of $80,000. It is purposed to begin work at an early date.

The Diamond Power Specialty Corporation, Detroit, manufacturer of Diamond soot blowers for water-tube and horizontal-return tubular boilers, has appointed W. L. Sullivan, 505 Central National Bank Building, Tulsa, Okla., as its representative for Oklahoma. Mr. Sullivan has been in Tulsa for several years specializing in the sale of power-plant equipment and machinery.

Nathaniel Baldwin, Inc., Salt Lake City, manufacturer of radio apparatus, has established a branch for Middle Western distribution in space of the Midland Warehouse & Transfer Company, 1524 Southwestern Avenue, in the central manufacturing district of Chicago.

The General Electric Company, merchandise department, announces the appointment of the GQ Electric Company, Milwaukee, as one of its distributing jobbers.

The Commercial Truck Company, Philadelphia, has just received an order from John Sexton & Company, Chicago, large wholesale grocery house, for twenty-six electric trucks.

The Miller-Selden Company, Detroit, electrical supply dealer, has been awarded an exclusive contract for distributing Triumph Electric Company motors in Detroit and its vicinity.

The Standard Light & Power Manufacturing Company, Baton Rouge, La., recently organized with a capital of $50,000, has tentative plans under way for a new local plant for the production of isolated electric lighting plants for farm and rural service. J. H. McLean is president and general manager.

The W. N. Matthews Corporation, St. Louis, at a recent meeting of the board of directors has declared a dividend of 7 per cent on the preferred stock of the company, payable July 1, 1924. The books of the company will be closed June 2, 1924.

The Westinghouse Electric & Manufacturing Company has secured an order from the Long Island Railroad Company for transformers and other equipment for six substations to be used in connection with the electrification of its line from Jamaica to Babylon, L. I. The contract totals $700,000.

The Rome Wire Company, Rome, New York, announces the removal of the New York office of its subsidiary company, the Atlantic Insulated Wire & Cable Company, from 52 Vanderbilt Avenue to the offices of the Rome Wire Company at 50 Church Street.

The Commercial Switchboard Manufacturing Company, Denver, has filed amended articles of incorporation changing the name of the company to the Commercial Manufacturing & Supply Company.

The Perfection Specialties Company, Elkhart Lake, Wis., has leased a factory and installed special machinery and equipment for the manufacture of a new combined radio battery charger and phonograph motor recently invented by its president, George C. Trotter.

The Radio Corporation of America, at a recent meeting of the board of directors, declared a dividend payable on all preferred stock to stockholders of record on June 6. The dividend will be 3½ per cent, being 1¾ per cent for both the first and the second quarters of 1924.

The Electric Safety Device Company, 1020 Guardian Building, Cleveland, is placing on the market a new safety switch which is especially adapted for use on washing machines or other electrical appliances.

New Equipment Available

Short Descriptions of New Apparatus and Accessory Equipment of Interest to the Electrical Industry and Available from Manufacturers and Announcements of New Lines

Polyphase Watt-Hour Meter

A new horizontal polyphase watt-hour meter with two completely independent standard single-phase elements geared to a special train register which adds the algebraic sum of the revolutions of the two meters has been developed by the Sangamo Electric Company, Springfield, Ill. The two elements being completely independent, both electrically and magnetically, may be independently calibrated and adjusted exactly like a single-phase meter. Since the two elements are mounted on separate staffs, it is claimed that there is less load on the bearings and consequently greater sustained accuracy. The meter is tested exactly as in the case of single-phase meters. Should an open potential circuit occur on either leg, it is at once indicated, since the element on the open leg will immediately stop rotating. The moving elements of both units are at all times visible through separate windows provided in the meter case.

Calculation of power-factor from comparative disk revolutions is made easy by means of a graph mounted on the terminal-box door of the meter. This graph enables disk revolutions to be translated directly into power factor, provided that the circuit is balanced. All parts of this new polyphase watt-hour meter are interchangeable with Sangamo Type-H single-phase meters.

Boiler-Room Instruments

Flush-front meters and gages for boiler-room use and designed for panel-board mounting have been developed by the Bailey Meter Company, Cleveland. The instruments are so constructed that the meter casings and all connecting piping are behind the panels.

The double-flush-front meter has been designed for a boiler equipped with an economizer. Steam flow and air flow are recorded on the left-hand chart, while the temperature of the feed water entering and leaving the economizer as well as the temperature of the flue gases leaving the boiler and leaving the economizer are recorded on the right-hand chart. An eight-pointer gage above the meter is suitable for installation on a boiler fired with a forced-blast chain-grate stoker. It indicates wind-box pressure, five compartment pressures, furnace draft and uptake draft.

This meter is also applicable for use on large double-outlet boilers where it is necessary to measure the steam flowing through the two outlets.

Safety Switch.—An improvement in the handle of the switch manufactured by the Super-Safety Switch Company, Chicago, is said to assure positive action besides preventing any possibility of a partial contact. This addition to the handle is located on the outside of the box and consists of a spring and cam action. With this arrangement the internal switch contacts are either all in or all out, thereby avoiding burning of the copper contacts. No change has been made in the internal switching mechanism. The cover of the box opens in the opposite way from previous manufactured boxes and must be closed in order to operate the switch. Although a spring is employed, its failure does not prevent operating the switch.

Floor Machine. A floor machine of aluminum using a horizontal motor has been developed by the Fay Company, 514 West Fifty-seventh Street, New York. The entire weight of the machine is supported by a special thrust bearing over 5 in. in diameter which relieves the machine of all undue friction, the full power of the motor being delivered to the brush. The machine is provided with a specially designed handle on which are the operating switch and cable arm. The handle can be adjusted to suit the height of the operator, and the machine can be operated on tables, benches and desks. All working parts are entirely inclosed and protected from dirt, grit, etc. Several attachments are furnished with the machine to take care of the various floor operations.

Portable Air Compressor.—A small portable air compressor, that has a piston displacement of 60 cu.ft. per minute and is known as the 4½-in. x 4-in. type 20, has been developed by the Ingersoll-Rand Company, 11 Broadway, New York. The compressor can be furnished with a variety of mountings and is available with either gasoline engine or electric motor drive. This compressor is said to embody all the new and proved features which are used in the larger units.

Heating Unit.—A heating unit of the grill type which is used for converting any oven into an electric oven has been developed by the Hankscraft Company, Madison, Wis. The heater plugs into a special socket which is attached to the oven wall by using only one screw. It operates from a 110-volt electric light socket and is of 660 watts capacity.

Automatic Time Switch. For the control of circuits of moderate rating a new automatic time switch, type T-7, has been placed on the market by the General Electric Company. A Warren synchronous motor is used in place of the conventional spring-driven clock commonly employed in other types. The new switch is for use only on alternating-current circuits where the frequency is properly regulated. The switch is about 12 in. high, 5 in. wide and about 4 in. deep. It is inclosed in a weatherproof case, thus being adapted for outdoor as well as indoor mounting. It is rated 20 amp., double-pole, single-throw, for use on circuits not exceeding 250 volts.

New Trade Literature

ELECTRICAL MEASURING INSTRUMENTS.—The Leeds & Northrup Company, 4901 Stenton Avenue, Philadelphia, is distributing the following publications: Catalog No. 75, entitled "Apparatus for Electrometric Determination of Hydrogen Ion Concentration," which is a reprint of the 1921 edition with a number of changes; bulletin No. 680, entitled "Macbeth Illuminometer," is a reprint of the 1920 edition with a number of changes and in a rearranged form; bulletin No. 871, entitled "Temperature Measurements in Generators, Transformers and Cable System," is a revision of the 1920 edition.

LIGHTNING ARRESTERS. — Bulletin No. 601 issued by the Electric Power Equipment Corporation, Philadelphia, covers the "Bennett" lightning arresters. It gives details of construction, installation and operation of the various types of the arresters.

AUTOMATIC SUBSTATION EQUIPMENT.—The Western Electro-Mechanical Company, Oakland, Cal., has issued a pamphlet covering its Type SS relays for application to existing installations of electric (remote-controlled) oil switches.

MINE VENTILATION. — The Coppus Engineering Corporation, Worcester, Mass., is distributing bulletin No. 116 covering the "Coppus Vano" blower for auxiliary mine ventilation.

ELECTRIC TRAMRAIL SYSTEM.—The Cleveland Electric Tramrail Division of the Cleveland Crane & Engineering Company, Wickliffe, Ohio, has issued catalog No. 3, covering the "Cleveland" electric tramrail system of hoisting and conveying loads for warehouses, foundries, machine shops, textile and paper mills, potteries, etc. It contains many illustrations showing various installations of its tramrail systems, cranes, carriers, elevators, etc.

CROSS-DRUM BOILERS.—"Heine Cross-Drum Boilers" is the title of bulletin No. 53, issued by the Heine Boiler Company, St. Louis, which describes the "Heine" "M"-type boilers, with horizontal baffling, and its "MC"-type boilers with cross baffling. These boilers can be built in units from 100 hp. to 1,500 hp. and for pressures up to 600 lb. per square inch.

ELECTRIC HAND LANTERNS. — The Crouse-Hinds Company, Syracuse, N. Y., is distributing two folders, one calling attention to its electric hand lanterns, including the type "LM" spot lantern for use in railway coach yards, shops, garages, etc., and the other describes its types "ELB," "ET" and "EY" condulets for concealing in concrete.

INSULATORS.—The Joslyn Manufacturing & Supply Company, 133 West Washington Street, Chicago, is distributing supplement No. 1 to its catalog No. 9, which describes the use and application of its expansion shields with its Nos. 1,950 and 1,630 wire holders.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number.

Purchase is desired in Brisbane, Australia (No. 10.313), for electrical accessories.

An agency is desired in Barcelona, Spain (No. 10,315), for electrical supplies.

An agency is desired in Cork, Ireland (No. 10,316), for motors, generators, cables, electric lamps, drawn wire, etc.

Purchase or agency is desired in Toronto, Canada (No. 10,314), for small motors, drills, hammers, etc.

Purchase is desired in Amsterdam, Netherlands (No. 10,311), for radio apparatus.

Purchase and agency is desired in Auckland, New Zealand (No. 10,312), for radio apparatus.

Purchase is desired in Rangoon, India (No. 10,371), for motion-picture machines and supplies.

PROPOSED HYDRO-ELECTRIC SCHEME FOR GREY, NEW ZEALAND.—A proposal to borrow £80,000 for a hydro-electric plant on the Arnold River to supply electricity to the whole district has been approved by the ratepayers.

HYDRO-ELECTRIC PROJECT FOR LITHUANIA.—The time limit for receiving tenders for construction of a hydro-electric plant on the Villa River near Kovno, notice of which was published in the issue of Feb. 16, according to *Commerce Reports*, has been extended, and engineers are now in the United States in order to consult contractors. Further information may be obtained from the Electrical Equipment Division, Bureau of Foreign and Domestic Commerce, Washington, D. C., or from any of the district offices, by referring to file No. 130,614.

New Incorporations

THE LULA (MISS.) LIGHT & POWER COMPANY has been incorporated with a capital stock of $10,000 by Walter A. Barnett, T. C. Crawford and others.

THE BANNERTOWN LIGHT COMPANY, Mount Airy, N. C., has been chartered by G. M. Slaughter, U. G. Bolton and others.

THE SHEALY'S ELECTRIC LINE COMPANY, Lexington, S. C., has been incorporated by M. M. Shealy, president and secretary, and B. V. Shealy, vice-president and treasurer.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

WATERFORD, ME. — The Waterford Light & Power Company contemplates changing 5 miles of its system from single-phase to three-phase. G. E. Dudley is manager.

ARLINGTON, MASS.—The Town Council is having plans prepared for the installation of a fire-alarm station and system, to cost about $139,000. McNaughton & Robinson, 46 Cornhill Street, Boston, are architects.

BOSTON, MASS.—The installation of a new lighting system in the South End district, covering the entire length of Shawmut Avenue, is under consideration.

CAMBRIDGE, MASS.—The trustees of Harvard University are considering erecting thirteen buildings, including a power plant (the first unit of seventeen buildings), on a site opposite the stadium on the Brighton side of Charles River as a Graduate School of Business Administration, to cost about $5,000,000. The total cost is estimated at $8,000,000.

EAST WEYMOUTH, MASS.—The Weymouth Light & Power Company has secured permission to issue $250,000, in bonds, part of the fund to be used for extensions and improvements.

RUTLAND, MASS.—Bids will be received by the United States Veterans' Bureau, Room 791, Arlington Building, Washington, D. C., until June 24, for construction of seven buildings, including electric work, heating, plumbing, etc., at the United States Veterans' Hospital No. 89, Rutland. Frank T. Hines is director.

Middle Atlantic States

BUFFALO, N. Y.—The City Council is considering a petition for the removal of the overhead lines on Jefferson Avenue from Dodge to East Ferry Street and the installation of an underground conduit system. The lines are the property of the Buffalo General Electric Company.

DUNDEE, N. Y.—E. L. Bailey, owner of the local electric light plant, contemplates extending the lines to Reading Centre, 3 miles; to the mines of the Morton Salt Company, 2 miles, and to North Reading and Westerly, 2 miles.

ELIZABETHTOWN, N. Y.—Improvements contemplated to the local system include changing the voltage from 1,200 to 2,400, erecting 2 miles of new line and installing a new street-lighting system. J. L. Webster is manager.

GENESEO, N. Y.—The Geneseo Gas Light Company plans to erect a 2-mile line into the country. William E. Hill is manager.

ILION, N. Y.—The Board of Light Commissioners has decided to extend the ornamental lighting system. Sixty-three units will be added.

KERHONKSEN, N. Y.—The C. H. Stokes Light Company contemplates the erection of a few miles of line extensions during 1924. C. H. Stokes is owner and manager.

OGDENSBURG, N. Y.—The St. Lawrence County Utilities, Inc., has been granted permission to erect a transmission line to Morristown, to furnish electrical service to farmers along the proposed line. The line will be extended at once to the Country Club, a distance of 7 miles, and later to Morristown.

ROCHESTER, N. Y.—The Rochester Gas & Electric Company, plans to build a twelve-story general operating and office building on East Avenue, to cost about $1,000,000. Gordon & Kaelber, Sibley Block, are architects.

ST. GEORGE, N. Y.—Contract has been awarded by the Staten Island Edison Corporation to the J. G. White Engineering Corporation, 43 Exchange Place, New York City, for the erection of a 33,000-volt transmission line from Livingston power station to Eltingville and for outdoor substations at Livingston and Eltingville.

SARATOGA SPRINGS, N. Y.—Bids will be received by the Board of Supervisors of Saratoga County, Saratoga, until June 17 for construction of dam, hydro-electric plant, transmission lines, fire-protection system, etc., for the Homestead Sanitarium in the town of Providence. The Utilities Engineering Company, 467 Broadway Albany, is engineer.

TUPPER LAKE, N. Y.—Bids will be received by the United States Veterans' Bureau, Room 791, Arlington Building, Washington, D. C., until June 17 for construction of a laundry building, including electric work, heating, etc., at the United States Veterans' Hospital No. 96, Tupper Lake.

WHITE PLAINS, N. Y.—Bids will be received at the office of the clerk of Board of Supervisors of Westchester County, Court House, White Plains, until June 2 for construction, including electric work, heating and plumbing of Nurses' Home and employees' dormitory as follows: Item E—For electric work required for nurses' home; Item H—electric work required for employees' dormitory. Walker & Gillette, 128 East Thirty-seventh Street, New York City, are architects.

BLOOMFIELD, N. J.—The Town Council is negotiating with the Public Service Electric Company for the installation of underground conduits in important streets and the elimination of present overhead lines.

DELTA, PA.—The Susquehanna Water Power Company has applied to the State Waters and Power Resources Board for permission to change the channel of the Susquehanna River in connection with its proposed hydro-electric plant just over the Maryland state line.

HOLTWOOD, P. — Interests identified with the Pennsylvania Water & Power Company, it is reported, have organized a new company with a capital stock of $3,500,000 for the purpose of building a new power plant on the Susquehanna River at Holtwood. The plans provide for an initial installation of 20,000 kw., with an ultimate capacity of 100,000 kw. Contract has already been placed for two units of 10,000 kw. each. The new company will be allied with the Pennsylvania Water & Power Company and the Consolidated Gas Electric Light & Power Company, Baltimore. The Pennsylvania Water & Power Company, it is understood, will soon build another hydro-electric plant on the Susquehanna River some distance above its present site.

PHILADELPHIA, PA.—The trustees of the Children's Home Hospital, Franklin and Thompson Streets, are considering additions to wards, nurses' home and power plant at the institution. Funds to the amount of $222,900 are available for the work.

PHILADELPHIA, PA.—Plans are being prepared by Zantzinge, Bone & Medary, Otis Building, for a chapel, dormitory, power plant, deanery and two faculty houses (five units of proposed group of fourteen units) at Forty-second and Spruce Streets for the Divinity School of the Protestant Episcopal Church, to cost about $1,000,000.

PITTSBURGH, PA.—Arrangements are being made by the Duquesne Light Com-

pany for extensive electrical development in the Pittsburgh district, involving an expenditure of about $10,000,000. The proposed improvements will include several new substations, to be completed before next winter, the erection of new feeders from the Brunot Island power station, and a complete revamping of the downtown underground system. Construction of a new substation in the Shanley district has been started. The company also plans to build a 50,000-hp. substation in McKeesport and a new substation in Beaver Falls of 30,000 hp. capacity.

CONCORD, DEL.—The Community Club is raising a fund for the installation of a municipal electric lighting plant.

FEDERAL PARK, MD.—Bids will be received by the United States Veterans' Bureau, Room 791, Arlington Building, Washington, D. C., until June 24 for construction of buildings and utilities, including electric work, heating, plumbing, electric elevator, outside service connections, etc., at the United States Veterans' Rehabilitation Center No. 2, Federal Park. Frank T. Hines is director.

WASHINGTON, D. C.—Bids will be received by the Bureau of Supplies and Accounts, Navy Department, until June 10, for a quantity of dry batteries for Eastern and Western yards (Schedule 2220) and for searchlights for Eastern and Western yards, (Schedule 2221); also until June 17, for electric soldering irons for Eastern and Western yards, (Schedule 2237), and for 223 electric flatirons for Eastern and Western yards (Schedule 2238).

North Central States

ALPENA, MICH.—The Alpena Power Company, recently organized, has secured permission to issue $500,000 in capital stock, the proceeds to be used in part for the acquisition of properties and extensions and improvements. Philip K. and Henry B. Fletcher head the company.

AKRON, OHIO.—The Northern Ohio Traction & Light Company contemplates installing additional equipment, including transformers, etc., at its Gorge station.

CLEVELAND, OHIO.—Steps have been taken by the Superior Avenue Association for the installation of an ornamental lighting system on that thoroughfare, to cost about $30,000. E. H. Bryant is president of the association.

LORAIN, OHIO.—The City Council is considering the installation of a new ornamental lighting system in the downtown section, to cost about $25,000.

NEW LONDON, OHIO.—Leroy Baker is reported to be in the market for equipment for an electric plant, including generator, etc., for this village.

NEW PHILADELPHIA, OHIO.—The Tuscarawas County Telephone Company contemplates the construction of a new exchange building, garage and warehouse and laying 7 or 8 miles of underground cable, to cost about $235,000.

UPPER SANDUSKY, OHIO.—The Ohio Power Company, Canton, has been granted a fifty-year franchise to supply electricity in Upper Sandusky, under the terms of which the company is to take over the municipal distributing system, which was never completed, and finish it.

YOUNGSTOWN, OHIO.—The State Utilities Commission has granted the Mahoning Power Lines Company permission to issue $50,000 in bonds and $53,000 in capital stock, the proceeds to be used to erect a 6,600-volt transmission line from Newton Falls to Milton Lake reservoir.

WILMORE, KY.—The trustees of Asbury College plan to rebuild the power house at the college, recently destroyed by fire, causing a loss of about $40,000.

NEWTON, ILL.—Plans are under way by the City Council for the construction of a new filtration plant at the municipal waterworks, to cost about $50,000. Electrical pumping and mechanical equipment will be installed.

ALMA, WIS.—Plans have been submitted to the City Council for the establishment of an electric light and power plant and distribution system. Tester & Schilling, Alma, are interested in the project.

CUMBERLAND, WIS.—The City Council is considering extending the lines of the municipal electric system on the Lake Road and extensions to the street-lighting system on West Grove Street.

MARINETTE, WIS.—The construction of another dam and power plant on the Menominee River to generate sufficient power to operate the additional paper machinery it proposes to install is under consideration by the Marinette & Menominee Paper Mill Company.

AITKIN, MINN. — The Prairie River Power Company has applied for a preliminary permit to develop 6,000 hp. at Ox Bow Rapids, near Aitkin.

LAKE CRYSTALL, MINN.—The installation of an improved lighting system in the business district is under consideration.

HUMBOLDT, IOWA.—Plans are being prepared by the Northwestern Light & Power Company, recently organized, for the construction of a large central station in Humboldt. The properties at Lake Park, Harris, Hull, Ocheyedan, Ashton, Bouton and Alvord have been purchased by the new company, which is also negotiating for other properties. D. M. Stearns, Humboldt, is president and general manager.

BOLIVAR, MO.—The Tri-Cities Power Company has acquired the municipal electric power plant and proposes to develop it for central-station service in this section.

HANNIBAL, MO.—Bids will be received by the Board of Public Works until June 6 for one switchboard and nine-motor-driven centrifugal pumps and auxiliary electrical apparatus for the municipal waterworks. The Burns & McDonnell Engineering Company, Interstate Building, Kansas City, is engineer.

HARTVILLE, MO.—Bids will be received by Fred Johnson, city clerk, until June 11, for construction of a municipal hydro-electric power station and distributing system, including one 42-kva. water-wheel-driven alternator, three-phase, 60-cycle, 2,300 volts; 25 hp. oil engine belt-connected to a 25 kva. alternator, with switchboard, etc. The Alexander Engineering Company, Woodruff Building, Springfield, is engineer.

PERRYVILLE, MO.—The Perry County Ice, Electric Light & Power Company, recently organized, is reported to be planning to erect a transmission line for local service. Preston T. Holcomb heads the company.

VELVA, N. D. — The Velva Light & Power Company contemplates discontinuing its gas-producer engine and installing a 100-hp. gas engine and remodeling plant. Preparations are being made by the town of Sawyer to erect a high-tension transmission line to connect with the local plant. W. E. Byerly is proprietor.

COTESFIELD, NEB.—Plans are being considered for the construction of a transmission line to Elba for connection with the system of the Central Power Company and the installation of a substation for local lighting service.

LOUP CITY, NEB. — The Loup City Light & Power Company plans to extend its service to several towns and enlarge its power plant this summer. Nelson Smith is superintendent.

CAMBRIDGE, KAN.—Bids, it is understood will soon be called for the construction of a transmission line for local light and power service. The cost is estimated at about $15,000. W. B. Rollins & Company, Railway Exchange Building, Kansas City, Mo., are engineers.

GARNETT, KAN.—The municipal water and light plant was recently destroyed by fire, causing a loss of about $75,000.

HAYS, KAN.—The United Light & Power Company, Downs, has acquired the local municipal electric plant and will furnish service from its transmission lines. Extensions to the system are contemplated.

LYONS, KAN.—The American Salt & Coal Company, Waldheim Building, Kansas City, Mo., it is reported, plans to install a power house at its proposed local salt evaporation plant, to cost about $800,000.

Southern States

CHARLOTTE, N. C.—The Southern Power Company plans to enlarge the dam on the Catawba River, near Fort Mill, S. C., and to increase the output of the power plant.

CHIMNEY ROCK, N. C.—The Chimney Rock Mountains, Inc., has engaged Mees & Mees, engineers, Charlotte, to prepare plans for a power dam and hydro-electric generating plant at Lake Lure.

PLYMOUTH, N. C.—The Council has issued $20,000 in bonds, the proceeds to be used for extensions and improvement in the municipal electric system.

RUTHERFORDTOWN, N. C.—A bond issue of $74,000 has been sold, a portion of the proceeds to be used for extensions and improvements in the municipal electric system.

WALNUT COE, N. C.—Bids will be received by the town of Walnut Cove until June 3 for two 400-hp. vertical waterwheels to be directly connected to umbrella-type generators and for two governors for above wheels. I. W. Barber, Mount Airy, is engineer.

ANNA MARIA, FLA.—The Board of Commissioners desires estimates and data on a complete electric plant, to cost from $5,000 to $6,000, also equipment for an ice-manufacturing plant, to cost about $3,500, to be operated in connection with the electric and waterworks plant. Machinery will also be required for the waterworks system.

BRADENTOWN, FLA.—The Southern Public Utilities Company plans to install an ornamental street-lighting system on Florida Avenue.

HAINES CITY, FLA.—The Council contemplates the installation of an ornamental lighting system in the business section, to cost about $12,000.

ORLANDO, FLA.—The Florida Public Service Company contemplates erecting a 33,000-volt transmission line from Deland through Orlando to Haines City and from Orlando to Eustis. N. H. Coit is superintendent.

PALATKA, FLA.—A special election has been called on July 1 to vote bonds for municipal improvements, including extensions to the street-lighting system and the installation of an ornamental lighting system in the business section.

TAMPA, FLA. — The Tampa Electric Company contemplates the installation of a 10,000-kva. Westinghouse turbine. T. J. Hanlon, Jr., is manager.

WINTER HAVEN, FLA. — The Lake Marion Grove Corporation plans to establish a town site, known as Morgan City, between Lake Hamilton and Haines, and proposes to install an electric light plant.

CHATTANOOGA, TENN.—The Tennessee Electric Power Company contemplates erecting a 110,000-volt transmission line (3 miles) from Ridgedale to the Georgia State line to connect with the lines of the Georgia Power Company. The work will include transformers, station, etc., and will cost about $100,000.

MORRISTOWN, TENN.—The Common Council has authorized the erection of a transmission line and the installation of a substation for local light and power service.

GLOSTER, MISS.—The Chamber of Commerce, O. P. McPherson secretary, is considering tentative plans for a street-lighting system.

MAMMOTH SPRINGS, ARK.—The property of the Mammoth Springs Light & Power Company has been acquired by the Central Power & Light Company, Walnut Springs.

BATON ROUGE, LA.—Plans for the proposed local plant of the Texas Chemical Company, Houston, Tex., to cost about $650,000, include a power house.

ELK CITY, OKLA.—The Inland Utilities Company has acquired a franchise to install an electric plant for commercial service. The company has applied for a franchise at Hobart, and is considering erecting a transmission line from Elk City to Hobart.

MOORELAND, OKLA.—H. J. Matrow, Mooreland, and associates, are planning to install an electric lighting plant on a tract of property on the Mooreland-Woodward Highway to be developed as an amusement park.

DALLAS, TEX.—In connection with the installation of an ornamental lighting system in the Oak Cliff section on which work has been started, the City Council plans to install three additional units in the system in this section, to be located on Lancaster, Tenth, Tyler and Jefferson Streets, and on North Bishop Street.

HOUSTON, TEX.—Plans are being considered for improvements to the lighting system in the North Main Street tunnel. Clarence George is city electrician.

MALAKOFF, TEX.—The Texas Power & Light Company has acquired lignite properties in Malakoff and is said to be planning the construction of a steam-operated electric power plant.

PORT ARTHUR, TEX. — The Eastern Texas Electric Company is erecting a second 33,000-volt line between Beaumont and Port Arthur, a distance of 20 miles, and is installing a new switchboard at the Port Arthur plant. S. P. MacFadden is superintendent.

Pacific and Mountain States

CAMAS, WASH. — The Northwestern Electric Company plans to erect a transmission line to the Grass Valley section and surrounding districts.

SUNNYSIDE, WASH.—The Council is considering improvements in the street-lighting system, including the installation of ornamental cluster standards in the business section.

TACOMA, WASH.—Bids, it is reported, will be asked late in June by the Municipal Power Bureau for the construction of a steel-tower transmission line across the Narrows for the municipal power project at Cushman.

BEND, ORE.—The Columbia Valley Power Company has tentative plans for the construction of a hydro-electric plant on the Deschutes River with initial capacity of 160,000 hp.

PILOT ROCK, ORE.—The Pacific Power & Light Company plans to extend its transmission system from Pendleton to Pilot Rock for electric service. A franchise has been granted.

CROCKETT, CAL.—The California & Hawaiian Sugar Refining Company, 230 California Street, San Francisco, contemplates the installation of electric power equipment in connection with proposed extensions and improvements at its local refining plant, to cost about $1,500,000.

EL CERRITO, CAL.—The Great Western Power Company is reported to be planning additions to its local Golden Gate substation, to cost about $500,000; also to enlarge substations at Antioch and Clayton, at a cost of about $200,000.

FRESNO, CAL.—The San Joaquin Light & Power Corporation is perfecting plans for the rebuilding a number of its transmission lines for heavier service. Extensions will also be made in several substations.

LOS ANGELES, CAL.—Bids will be received by the Public Service Commission, 207 South Broadway, until June 10 for porcelain insulators and line hardware (Specification P-327). James P. Vroman is secretary.

OAKLAND, CAL.—The Great Western Power Company contemplates building a new substation and steam heating plant in Oakland, to cost about $425,000. The equipment will include 11,250 kw. in step-down transformers and direct-current generating equipment in addition to steam heating plant.

SAN FRANCISCO, CAL. — The Pacific Gas & Electric Company has appropriated $500,000 additional for improvements to its East Bay system. Improvements will be made to five substations.

SAN FRANCISCO, CAL.—The California Oregon Power Company has applied to the State Railroad Commission for an approval of an agreement under which it is to build a second power plant on the Klamath River in Siskiyou County and to sell the power generated to the Pacific Gas & Electric Company. The proposed plant will have a capacity of 25,000 kw. Approval was also asked for the sale of $4,000,000 in bonds and $1,000,000 in capital stock to finance the project.

FALLON, NEV.—The Electric Light Commission is considering establishing a 2,300-volt circuit for power purposes only. W. D. Atkinson is city clerk.

CARLSBAD, N. M.—The Public Utilities Company may install a 100-kw. hydro-electric unit to replace some old equipment. E. A. Roberts is general manager.

Canada

SOURIS, MAN.—The Council is considering an addition to the municipal power station and the purchase of a new generator.

CHATHAM, ONT.—Work, it is stated, will begin at once on the erection of a transmission line from the Blenheim substation along the Lake Shore Road through Cedar Springs to Highbanks. A branch line will be erected to Erieau. The local manager of the Chatham Hydro-System has been instructed to begin work on the proposed extension into Dover Township.

RADVILLE, SASK.—The Town Council is considering building a municipal electric light plant.

SASKATOON, SASK.—The City Council is considering the purchase of mechanical equipment for power plant, to cost $30,000 and the expenditure of $15,000 for improvements.

Electrical Patents

Announced by U. S. Patent Office

(Issued April 29, 1924)

1,492,216. ALTERNATING-CURRENT MOTOR; H. Nehlsen, Waidmannslust, Germany. App. filed March 16, 1923. Polyphase type with method of interconnecting the primary and secondary windings so that voltage induced between the terminals of the secondary winding is low under starting conditions and high under running conditions.

1,492,219. PARTY-LINE TELEPHONE-EXCHANGE SYSTEM; R. L. Quass, Hawthorne, N. J. App. filed Dec. 22, 1920.

1,492,258. WELDING SEGMENTS OF HOLLOW ARTICLES; J. B. Murray and T. E. Murray, Jr., Brooklyn, N. Y. App. filed July 24, 1923.

1,492,260. STORAGE-BATTERY SEPARATOR; P. E. Norris, Wilkinsburg, Pa. App. filed Oct. 8, 1921. Comprising two or more members or sheets usually of dissimilar materials.

1,492,269. ELECTRIC SIGNAL; C. T. Schirmer, Newton, Mass. App. filed Jan. 5, 1922. For use on direct or alternating current.

1,492,293. IGNITION DEVICE FOR INTERNAL-COMBUSTION ENGINES; W. Grunow, Newark, N. J. App. filed April 7, 1919.

1,492,296. RECEIVING APPARATUS FOR WIRELESS COMMUNICATION; H. H. Hipwell and H. T. Hipwell, Pittsburgh, Pa. App. filed Feb. 2, 1922. Using a telephone as a loud speaker.

1,492,297. BATTERY; H. T. Hipwell, Pittsburgh, Pa. App. filed May 24, 1922. Of the multi-cell type with switch for varying voltage combined with battery.

1,492,300. MEANS FOR ELECTRIC AVIATIC PROOF AND MEASURING OF THE DISTANCE OF ELECTRIC CONDUCTIVE BODIES; H. Lowy, Vienna, Austria. App. filed July 17, 1923.

1,492,302. ELECTRODE; J. R. MacMillan, La Salle, N. Y. App. filed May 12, 1922. Carbon electrode containing electrically conductive dehydrated Fe_3O_4.

1,492,309. SWITCHBOARD; C. E. Ogden, Cincinnati, Ohio. App. filed Sept. 19, 1919. Adapted for charging storage batteries of motor vehicles.

1,492,318. MASTER CLOCK; T. S. Casner, Plainfield, N. J. App. filed Oct. 22, 1920.

1,492,319. APPARATUS FOR MEASURING DEPTH OF WELLS; C. M. Copeland, Graham, Tex. App. filed May 31, 1921.

1,492,321. RADIO SIGNALING SYSTEM; H. de R. de Bellescize, Toulon, France. App. filed Aug. 29, 1921.

1,492,335. ATTACHMENT DEVICE; S. McClatchie, Cambridge, Mass. App. filed March 21, 1919. Swivel attachment plug.

1,492,340. ELECTRICAL SYSTEM FOR SELF-PROPELLED VEHICLES; R. Varley, Englewood, N. J. App. filed Oct. 11, 1920.

1,492,348. ELECTRICAL CONNECTOR DEVICE; R. B. Benjamin, Chicago, and W. A. Alden, Camp Grant, Rockford, Ill. App. filed June 12, 1918.

1,492,359. GRID PLATE FOR BATTERIES; G. Davis and L. M. Samuel, New York, N. Y. App. filed Sept. 16, 1921.

1,492,396. AUTOMATIC TELEPHONE SYSTEM; R. G. Richardson, Chicago, Ill. App. filed Feb. 14, 1916.

1,492,430. LIQUID RHEOSTAT; W. B. Crossland, Philadelphia, Pa. App. filed Oct. 13, 1922. Automatically operated upon the closing of a switch in the circuit.

1,492,435. BATTERY CAKE; W. S. Doe, Kent, Ohio. App. filed March 30, 1922. A compressed dry cake which can be used to renew dry batteries upon being moistened and placed between a positive and a negative element.

1,492,450. MOTOR FOR ANIMATED AND ADVERTISING SIGNS; E. E. Gregory, Louisville, Ky. App. filed Nov. 4, 1922. Solenoid type.

1,492,495. SAFETY APPLIANCE FOR ELEVATORS; E. Turgeon, Thompsonville, Conn. App. filed May 4, 1923. Elevator and landing trip mechanisms.

1,492,496. INSULATOR AND TRANSPOSITION DEVICE; T. A. Vernor, Smiley, Tex. App. filed July 12, 1921.

1,492,532. SWIVEL ATTACHMENT PLUG; W. A. Phillips, Muskegon, Mich. App. filed Oct. 31, 1921.

1,492,540. ELECTRICAL HEATING DEVICE; A. J. Kercher, Berkeley, and W. W. Hicks, San Francisco, Cal. App. filed June 5, 1922. To be used with ranges, etc.

(Issued May 6, 1924)

1,492,566. ELECTRICAL CONNECTING PLUG; C. Kraft, New York, N. Y. App. filed June 6, 1922. Adjustable, for use with a jack.

1,492,589. VISUAL AND AURAL DETERMINATION OF DIRECTION AND DISTANCE OF SOUND; W. L. Walker, New York, N. Y. App. filed Jan. 10, 1918.

1,492,595. SURGICAL BAKER; W. S. Edmands, Boston, Mass. App. filed May 27, 1921. Adjustable.

1,492,636. PROCESS FOR THE MANUFACTURE OF CHROMATES AND BICHROMATES; A. Jouve and A. Helbronner, Paris, France. App. filed March 14, 1922. By electrolyzing directly a chromium alloy (such as the ferrochromiums) in an electrolyte of alkali carbonate (such as sodium carbonate).

1,492,641. METHOD OF AND APPARATUS FOR WELDING; S. Lake, Milford, Conn. App. filed Dec. 3, 1919. For the welding of tubular or other structures by either the butt or lap-joint type of weld.

1,492,655. TELEPHONE SYSTEM; S. Suekoff, Chicago, Ill. App. filed Sept. 11, 1920. For connecting between automatic and manual exchanges.

1,492,657. CLIP JAWS; H. E. Walker, Chicago, Ill. App. filed Oct. 2, 1922. For current-carrying clips.

1,492,676. LIQUID-HEATING UNIT; W. F. Clark, Warren, Pa. App. filed April 2, 1921. Liquid to be heated is circulated through a tubular member. The resistance element is wound on a sleeve of insulating material which is so constructed as to support the wire.

1,492,691. CONTROL SYSTEM; O. M. Leich, Genoa, Ill. App. filed Dec. 7, 1922. For controlling the supply of current to an electrical device, such as a light in a railway signal.

1,492,700. IGNITER FOR GAS ENGINES; B. P. Remy and F. I. Remy, Indianapolis, Ind. App. filed Sept. 30, 1921.

1,492,701. INDUSTRIAL TRUCK; C. E. Cochran, Cleveland, Ohio. App. filed March 12, 1923. With special speed-control mechanism.

1,492,702. CONTROLLING OF POWER ENGINES; P. P. Deutschmann, Berlin-Charlottenburg, Germany. App. filed Dec. 27, 1920. Control device for electric machines having a system of connection embodying one or more resistances adapted to cause the braking period immediately to succeed the starting (speeding-up) period.

1,492,708. ELECTRIC COMMUTATOR; H. Haage, Berlin-Charlottenburg, Germany. App. filed Jan. 23, 1922. Mounted on its shaft with a comparatively short part of its inner length only.

1,492,712, 1,492,713. PROCESS FOR THE PRODUCTION OF PROSPHORUS AND POTASH COMPOUNDS; B. G. Klugh, Chicago, Ill. App. filed Sept. 20, 1920. By electric smelting.

1,492,714. INSULATOR CLAMP; C. G. Koppitz, Greensburg, Pa. App. filed April 8, 1910. For clamping adjoining insulator sections together.

1,492,728. ELECTRICAL SYNCHRONIZING SYSTEM; J. H. Hunt, Dayton, Ohio. App. filed Sept. 11, 1920. As applied to aëroplane gunfire.

1,492,743. FLASHLIGHT; C. Osean, Woodcliff, N. J. App. filed March 4, 1922. With unit-cell batteries of the flat type.

1,492,746. ELECTROPNEUMATIC TELEGRAPH CONTROL RELAY; H. Pratt, San Francisco, Cal. App. filed May 7, 1919.

1,492,752. RELAY SYSTEM; W. Schottky, Wurzburg, Germany. App. filed Nov. 2, 1920. For thermionic repeaters arranged in cascade such as are employed in connection with telephony.

1,492,766. PLUG OSCILLATOR SUPPORT; H. R. Van Deventer, Edgewood, Pa. App. filed Dec. 13, 1920. For igniting charges of compressed gases in explosion motors.

1,492,774. RHEOSTAT; J. C. Boyton, Cleveland, and H. A. Stevenson, Lakewood, Ohio. App. filed May 3, 1922. Where the resistor element is composed of carbon or like substance.

1,492,781. SEMAPHORE SIGNAL FOR AUTOMATIC SWITCHES; J. Erickson, Chicago, Ill. App. filed June 1, 1920. Of the individual rotary type.

1,492,796. SHORT-CIRCUITING DEVICE; W. H. Himes, Pittsburgh, Pa. App. filed May 11, 1921. Centrifugally actuated for dynamo-electric machines.

1,492,800. ELECTRIC WELDING APPARATUS; A. G. Jaeger, Dubuque, Iowa. App. filed Nov. 20, 1922. Gasoline-engine-driven portable electric arc-welding outfit.

1,492,816. RETAINER FOR STORAGE-BATTERY MATERIAL; W. B. Stone, Webster, Mass. App. filed Jan. 25, 1923.

1,492,821. ANTI-FREEZING DEVICE; M. P. Weinbach, Columbia, Mo. App. filed Sept. 29, 1922. Applicable to the cooling systems of automobiles during winter.